

VOLUME 13, 1920

JOURNAL

OF

ECONOMIC ENTOMOLOGY

OFFICIAL ORGAN AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS



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Published by
AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS
CONCORD, N. H.

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Second Annual Meeting, Champaign, Ill., Nov. 11-13, 1890. (The same officers had charge of this meeting.)

Third Annual Meeting, Washington, D. C., Aug. 17-18, 1891. President, James Fletcher; First Vice-President, F. H. Snow; Second Vice-President, Herbert Osborn; Secretary, L. O. Howard.

Fourth Annual Meeting, Rochester, N. Y., Aug. 15-16, 1892. President, J. A. Lintner; First Vice-President, S. A. Forbes; Second Vice-President, J. H. Comstock; Secretary, F. M. Webster.

Fifth Annual Meeting, Madison, Wis., Aug. 14-16, 1893. President, S. A. Forbes; First Vice-President, C. J. S. Bethune; Second Vice-President, John B. Smith; Secretary, H. Garman.

Sixth Annual Meeting, Brooklyn, N. Y., Aug. 14-15, 1894. President, L. O. Howard; First Vice-President, John B. Smith; Second Vice-President, F. L. Harvey; Secretary, C. P. Gillette.

Seventh Annual Meeting, Springfield, Mass., Aug. 27-28, 1895. President, John B. Smith; First Vice-President, C. H. Fernald; Secretary, C. L. Marlatt.

Eighth Annual Meeting, Buffalo, N. Y., Aug. 21-22, 1896. President, C. H. Fernald; First Vice-President, F. M. Webster; Second Vice-President, Herbert Osborn; Secretary, C. L. Marlatt.

Ninth Annual Meeting, Detroit, Mich., Aug. 12-13, 1897. President, F. M. Webster; First Vice-President, Herbert Osborn; Second Vice-President, Lawrence Bruner; Secretary, C. L. Marlatt.

Tenth Annual Meeting, Boston, Mass., Aug. 19-20, 1898. President, Herbert Osborn; First Vice-President, Lawrence Bruner; Second Vice-President, C. P. Gillette; Secretary, C. L. Marlatt.

Eleventh Annual Meeting, Columbus, Ohio, Aug. 18-19, 1899. President, C. L. Marlatt; First Vice-President, Lawrence Bruner; Second Vice-President, C. P. Gillette; Secretary, A. H. Kirkland.

Twelfth Annual Meeting, New York, N. Y., June 22-23, 1900. President, Lawrence Bruner; First Vice-President, C. P. Gillette; Second Vice-President, E. H. Forbush; Secretary, A. H. Kirkland.

Thirteenth Annual Meeting, Denver, Colo., Aug. 23-24, 1901. President, C. P. Gillette; First Vice-President, A. D. Hopkins; Second Vice-President, E. P. Felt; Secretary, A. L. Quaintance.

Fourteenth Annual Meeting, Pittsburgh, Pa., June 27-28, 1902. President, A. D. Hopkins; First Vice-President, E. P. Felt; Second Vice-President, T. D. A. Cockerell; Secretary, A. L. Quaintance.

Fifteenth Annual Meeting, Washington, D. C., Dec. 26-27, 1902. President, E. P. Felt; First Vice-President, W. H. Ashmead; Second Vice-President, Lawrence Bruner; Secretary, A. L. Quaintance.

Sixteenth Annual Meeting, St. Louis, Mo., Dec. 29-31, 1903. President, M. V. Slingerland; First Vice-President, C. M. Weed; Second Vice-President, Henry Skinner; Secretary, A. F. Burgess.

Seventeenth Annual Meeting, Philadelphia, Pa., Dec. 29-30, 1904. President, A. L. Quaintance; First Vice-President, A. F. Burgess; Second Vice-President, Mary E. Murtfeldt; Secretary, H. E. Summers.

Eighteenth Annual Meeting, New Orleans, La., Jan. 1-4, 1906. President, H. Garman; First Vice-President, E. D. Sanderson; Second Vice-President, F. L. Washburn; Secretary, H. E. Summers.

Nineteenth Annual Meeting, New York, N. Y., Dec. 28-29, 1906. President, A. H. Kirkland; First Vice-President, W. E. Britton; Second Vice-President, H. A. Morgan; Secretary, A. F. Burgess.

Twentieth Annual Meeting, Chicago, Ill., Dec. 27-28, 1907. President, H. A. Morgan; First Vice-President, H. E. Summers; Second Vice-President, W. D. Hunter; Secretary, A. F. Burgess.

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Twenty-sixth Annual Meeting, Atlanta, Ga., Dec. 31, 1913-Jan. 2, 1914. President, P. J. Parrott; First Vice-President, E. L. Worsham; Second Vice-President, Wilmon Newell; Secretary, A. F. Burgess.

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THIRTY-THIRD ANNUAL MEETING OF THE AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS

Chicago, Ill., December 29-31, 1920

The thirty-third annual meeting of the American Association of Economic Entomologists will be held in Kent 20, University of Chicago, December 29 to 31, inclusive.

Sessions will open at 10 a. m., Wednesday, December 29. The annual reports of officers and standing committees will be presented and the opening business transacted. This will be followed by the annual address of the President. The meeting will be continued at 1.30 p. m., and on Thursday morning at 10 a. m. Papers will be presented at the Friday afternoon session and the final business will be transacted at that time.

Sectional Meetings

The meeting of the Section on Apiculture will be held at 8.00 p. m., Wednesday, December 29. The Section on Horticultural Inspection will meet at 1.30 p. m., Thursday, December 30.

Joint Meeting

A joint meeting of this association with the American Phytopathological Society will be held in Mandel Hall, University of Chicago, Friday, at 10 a. m.

Other Meetings

The annual meeting of the American Association for the Advancement of Science and its many affiliated societies will be held throughout the week. The Entomological Society of America will meet on Monday and Tuesday, December 27 and 28.

Hotel Headquarters

Headquarters for this association will be at the Sherman Hotel, Clark and Randolph streets, where the following rates have been secured:

	Without Bath	With Bath
One in room.....	\$2.50-\$3.00	\$3.50-\$6.00
Two in room.....	4.00-	5.00-10.00

Members must engage rooms promptly, as the hotel is likely to be crowded.

Railroad Rates

Information concerning railroad rates to the meeting should be secured direct from Dr. Burton E. Livingston, Permanent Secretary, American Association for the Advancement of Science, Smithsonian Institution, Washington, D. C.

Smoker

The members of this association are invited to attend the Biologists' Smoker which will be held Tuesday evening, December 28, at 8.00 p. m. Dr. W. M. Wheeler will give the Vice-Presidential Address of Section F at the opening of the smoker, on "The Organization of Research." The place for holding this smoker will be announced later.

Dinner

The President of the association has planned for an entomologists' dinner similar to the one held at the last annual meeting, and Thursday evening, December 30, has been reserved for this event. Arrangements for the dinner are being made by a committee of which Mr. W. C. O'Kane is Chairman. Further details will be announced at the time of the meeting.

Membership

Applications for membership can be secured from the Secretary or from members of the committee on membership. All applications should be made out, properly endorsed, and filed with the membership committee on or before December 30.

Program

Wednesday, December 29, 1920, 10.00 a. m.

Report of the Secretary.

Report of the executive committee, by President Wilmon Newell.

Report of the representative to the National Research Council, by P. J. Parrott, Geneva, N. Y.

Report of the committee on policy, by W. C. O'Kane, Durham, N. H.

Report of the committee on nomenclature, by Edith M. Patch, Orono, Me.

Report of the committee on index of economic entomology, by E. P. Felt, Albany, N. Y.

Appointment of committees.

Miscellaneous business.

New business.

Annual address of the President, Wilmon Newell, Gainesville, Fla.,
 "On the Organization of Work in Economic Entomology."

Address by Dr. C. E. McClung, Chairman, Division of Biology and
 Agriculture, National Research Council.

"Industrial Support for Scientific Work," by W. G. O'Kane, Durham,
 N. H. (15 minutes.)

Adjournment.

Program

Wednesday, December 29, 1920, 1.30 p. m.

Discussion of the Presidential Address.

READING OF PAPERS

"A Volunteer Pest Reporting Service," by S. B. Fracker, Madison,
 Wis. (10 minutes.)

The corps of volunteer pest correspondents secures valuable information for
 immediate use and for permanent records.

"The Value of Entomological Service to the Ohio Farm Bureaus in
 Their Effort to Control the Hessian-fly," by H. A. Gossard,
 Wooster, Ohio, and T. H. Parks, Columbus, Ohio. (15 min-
 utes.) Lantern.

How research and extension methods were used to guide the growers past a
 late departing fall brood of fly.

"Facts Concerning Periodical Outbreaks of Beet Leaf-hopper (*Eutettix
 tenella* Baker) in California," by Henry H. P. Severin, Berkeley,
 Calif. (15 minutes.)

Migrations depleting the natural breeding area is the primary factor and
 parasitism is of secondary importance in causing the periodicity of the
 beet leaf-hopper (*Eutettix tenella* Baker).

"The Potato Leaf-hopper and Tarnished Plant Bug in 1916," by S.
 Marcovitch, Knoxville, Tenn. (5 minutes.)

"Further Notes on the Life History of the Potato Leaf-hopper," by
 Albert Hartzell, Ames, Iowa. (10 minutes.)

Additional data on life history of *E. mali* with special reference to maximum
 number of eggs per female, longevity of adults and number of generations.

- "The Influence of Leaf-hopper Control on Potato Yields," by John R. Eyer, State College, Pa. (5 minutes.)

A brief discussion of results obtained in commercial potato plantings.

- "Further Experiments with *Empoasca mali* Concerning Its Relation to Potato Tipburn," by F. A. Fenton, Ames, Iowa. (10 minutes.)

Progress report of the season's work on the production of tipburn.

- "Chinch-bug Resistance Shown by Certain Varieties of Corn," by W. P. Flint, Urbana, Ill. (10 minutes.) Lantern.

Results of three years' work with certain drought resistant varieties of corn to test their resistance to chinch-bug.

- "Life History of the Native Corn Borer (*Pyrausta ninsliei* Heinr.) at Ames, Iowa," by I. L. Ressler, Ames, Iowa. (10 minutes.)

Report on biology and seasonal history of this pest.

- "Some Results of Variety Tests in the European Corn Borer Investigation in Central New York," by C. F. Turner, Schenectady, N. Y. (10 minutes.)

Showing the relative susceptibility of different types of corn to corn borer injury.

- "European Corn Borer in New York State," by E. P. Felt, Albany, N. Y. (15 minutes.)

A summary of recent investigations with special reference to control methods.

- "The Corn Leaf Aphis (*Aphis maidis* Fitch) in Kansas," by James W. McColloch, Manhattan, Kan. (10 minutes.) Lantern.

Importance, life history and certain control measures.

- "The Effect of Poisoned Bran Mash on Grasshoppers and the Lapse of Time Between Poisoning and Death," by A. L. Ford, Brookings, S. D. (To be read by title.)

- "Observations on the Attractiveness of Materials Used in Grasshopper Baits," by A. L. Ford, Brookings, S. D., and W. H. Larrimer, W. Lafayette, Ind. (To be read by title.)

- "Some Factors Influencing the Efficiency of Grasshopper Baits," by W. H. Larrimer, W. Lafayette, Ind., and A. L. Ford, Brookings, S. D. (To be read by title.)

- "Arizona Wild Cotton and Its Insect Enemies in Relation to the Cotton Industry of the Arid Southwest," by A. W. Morrill, Los Angeles, Calif. (15 minutes.)

A consideration of a complicated entomological problem and methods by which it may be handled without unnecessarily endangering cultivated cotton.

- "A Contribution Toward the Control of *Peridroma saucia* as a Tomato Fruit Worm," by C. L. Metcalf, Columbus, Ohio. (3 minutes.) Lantern.

Successful use of a poisoned bait against this pest on maturing tomatoes.

- "The Pea Moth in Wisconsin," by Chas. L. Fluke, Jr., Madison, Wis. (6 minutes.)

A review of the life history and habits of the moth and a short discussion of control measures.

- "Observations of the Fall Army Worm and Some Control Experiments," by Roger C. Smith, Manhattan, Kan. (8 minutes.)

Field observations on our recent outbreak and control experiments with poison bran mash prepared several ways.

- "*Mecas inornata* Say, a Girdler on Artichoke," by W. J. Baerg, Fayetteville, Ark. (5 minutes.) Lantern.

A brief description of the insect and the injury caused by it.

Adjournment.

SECTION OF APICULTURE

F. B. PADDOCK, *Chairman*.

G. M. BENTLEY, *Secretary*.

Program

Wednesday, December 29, 1920, 8.00 p. m.

Address by the Chairman—"Better Queens"—F. B. Paddock, Ames, Iowa.

READING OF PAPERS AND DISCUSSIONS.

- "Some Apicultural Investigations," by Wallace Park, Ames, Iowa. (15 minutes.)

- "The Problem of Controlled Fertilization of Queen Bees," by L. V. France, University Farm, St. Paul, Minn. (10 minutes.)

- "The Relationship Between the Complete Life Cycle of the Honey Bee and the Blooming Dates of the More Important Honey Plants," by H. B. Parks, San Antonio, Texas. (10 minutes.)

- "Further Notes on the Value of Winter Production of Bees," by J. H. Merrill, Manhattan, Kan. (15 minutes.)

"Beekeeping Problems Which Should Be Undertaken by the Experiment Stations," by Frank C. Pellett, Hamilton, Ill. (10 minutes.)

Symposium—Foul Brood—(40 minutes).

"Stopping the Distribution of American Foul Brood at Its Source," by S. B. Fracker, Madison, Wis.

"Legislation for Control of Foul Brood," by M. C. Tanquary, College Station, Texas.

"Mixed Infections in the Brood Diseases of Bees," by A. P. Sturtevant, Washington, D. C.

"The Future of Bee Disease Control," by E. F. Phillips, Washington, D. C.

Transaction of business and selection of officers.

Adjournment.

Program

Thursday, December 30, 1920, 10.00 a. m.

READING OF PAPERS

"Control Work on the Pecan Nut Case Bearer," by S. W. Bilsing, College Station, Texas. (15 minutes.)

This paper summarizes the control work on the pecan nut case bearer. A comparison is made of twenty-five sprayed trees with twenty-five unsprayed trees for the season of 1920.

"Lepidopterous Larvæ Injurious to Apple in Pennsylvania," by S. W. Frost, Arendtsville, Pa. (10 minutes.)

Including several new injurious species.

"Fumigation with Hydrogen Cyanide for the Control of the Pear Psylla," by R. L. Webster, Ithaca, N. Y. (10 minutes.)
Lantern.

A brief account of experiments in which an attempt is made to apply California fumigation methods to New York State.

"Studies of the Western Peach and Prune Root Borer (*Sanninoidea opalescens*)," by Frank H. Lathrop and A. B. Black, Corvallis, Ore. (5 minutes.)
Lantern.

Observations on life history and habits of the root borer in Oregon with brief discussion of control methods tested by the Oregon Experiment Station.

"Some Experiments with Paradichlorobenzene and Other Chemicals for the Control of the Peach Tree Borer, *Sanninoidea exitiosa* Say," by Alvah Peterson, New Brunswick, N. J. (15 minutes.)
Lantern.

The effect of paradichlorobenzene, orthodichlorobenzene, mercuric chloride, etc., on peach trees and peach tree borers of varying ages.

"Parasitism and Nicotine in the Control of the Oriental Peach Moth:
A Second Report," by Louis A. Stearns, Leesburg, Va. (10
minutes.)

"The Codling Moth,—a Quandary and a Query," by Glenn W. Her-
rick, Ithaca, N. Y. (5 minutes.)

A general summary of the problem of control for purposes of discussion.

"The Status of the Work Against the Green Japanese Beetle," by
C. H. Hadley, Riverton, N. J. (12 minutes.)

Present status of the project; future plans.

"Some Insect Problems Confronting the Avocado Grower," by G. F.
Moznette, Miami, Fla. (10 minutes.)

A short paper describing what insects are of especial importance to the avocado
industry in the United States, injury caused, etc.

"The Spreading of Sprays," by William Moore, St. Paul, Minn. (15
minutes.)

Discussion of theory of spreading of sprays and the substances which will pro-
duce spreading.

"Notes on a New Insecticide," by E. N. Cory, College Park, Md.
(8 minutes.)

An alcoholic extract of pyrethrum which shows considerable promise from
tests on a number of different insects.

"Biological Control Work Against the Black Scale in California," by
Harry S. Smith, Sacramento, Calif.

Adjournment.

SECTION OF HORTICULTURAL INSPECTION

J. G. SANDERS, *Chairman*.

E. R. SASSER, *Secretary*.

Program

Thursday, December 30, 1920, 1.30 p. m.

Address by the Chairman, J. G. Sanders, Harrisburg, Pa.

READING OF PAPERS AND DISCUSSIONS

"Recent Work of the Federal Horticultural Board," by C. L. Marlatt,
Washington, D. C. (15 minutes.)

- "Present Status of the Gipsy Moth in New Jersey," by Thomas J. Headlee, New Brunswick, N. J. (15 minutes.)
- "Activities of the Federal Horticultural Board on the Mexican Border," by O. D. Deputy, Laredo, Texas. (15 minutes.)
- "Standardized Nursery Inspection," by F. M. O'Byrne, Gainesville, Fla. (15 minutes.)
- "Some Problems in Greenhouse Inspection in Indiana," by H. F. Dietz, Indianapolis, Ind. (15 minutes.)
- "Sweet Potato Weevil Eradication in Florida," by J. E. Graf, Maccleny, Fla. (15 minutes.)
- "Plant Quarantine Work at Florida Ports," by J. H. Montgomery, Gainesville, Fla. (15 minutes.)
- "Operation of Quarantine 37," by R. Kent Beattie, Washington, D. C. (15 minutes.)
- "The Japanese Beetle Quarantine," by C. W. Stockwell, Riverton, N. J. (5 minutes.)
- "Important Foreign Insect Pests Collected on Imported Nursery Stock in 1920," by E. R. Sasscer, Washington, D. C. (15 minutes.)

Transaction of business and selection of officers.

Adjournment.

Program

Friday, December 31, 1920, 10.00 a. m.

Joint meeting of the American Association of Economic Entomologists and the American Phytopathological Society. Dr. W. A. Orton, President of the American Phytopathological Society, will preside.

Symposium on "Dusting as a Means of Controlling Injurious Insects and Plant Diseases." Insect control will be presented by P. J. Parrott, Geneva, N. Y., and T. J. Headlee, New Brunswick, N. J. Plant disease control by N. J. Giddings, Morgantown, W. Va., and H. A. Edson, Washington, D. C. Each paper will be presented in 10 minutes, after which the whole subject will be thrown open for general discussion.

Adjournment.

Program

Friday, December 31, 1920, 1.30 p. m.

READING OF PAPERS AND DISCUSSIONS

- "Ecological Observations on the Hemiptera of the Cranberry Lake Region of the Adirondacks," by Herbert Osborn, Columbus, Ohio, and C. J. Drake, Syracuse, N. Y. (10 minutes.) Lantern.

General survey of ecologic conditions with observations on economic relations and mention of some of the more important species.

- "Insects Attacking Ferns in the Hawaiian Islands," by O. H. Swezey, Honolulu, Hawaii. (5 minutes.)

Enumeration and notes on the same.

- "Recent Insect Immigrants in Hawaii," by O. H. Swezey, Honolulu, Hawaii. (10 minutes.)

List with notes of first records and spread.

- "An Insect Fearing Neither Fire nor Water," by A. C. Burrill, Columbia, Mo. (15 minutes.) Lantern.

The government 1913 campaign was first to gain success over the coulee cricket (*Peranabrus scabricollis*) and the ways devised to control them are applicable to other Orthoptera.

- "Grasshopper and Cricket Repellents," by W. H. Larrimer, W. Lafayette, Ind. (5 minutes.) Lantern.

Results of experiments to secure a material with which binder twine can be treated to prevent the cutting of bands by insects while grain is in the shock.

- "The Response of the Bean Weevil to Different Percentages of Atmospheric Moisture," by Thomas J. Headlee, New Brunswick, N. J. (15 minutes.) Lantern.

Response indicated by a curve; the response has been determined under a constant temperature of 80° F.

- "Flour Mill Fumigation with Liquid Hydrocyanic Acid," by E. A. Back, Washington, D. C. (5 minutes.)

General statement regarding use.

- "The European Red Mite, *Paratetranychus pilosus* Can. and Fanz., in Connecticut," by Philip Garman, New Haven, Conn. (5 minutes.)

- "Preliminary Notes on Control of Millipedes Under Sash," by J. L. Horsfall and J. R. Eyer, State College, Pa. (10 minutes.)

Comparative data on use of insecticides and repellents for control of millipedes.

"Life History of *Peridroma margaritosa*," by F. M. Wadley, Rockford, Ill. (10 minutes.)

Brief paper giving records of occurrence and rearing in their bearing on the life and seasonal history of the species. Note on dimorphism.

"Notes on the Life History and Control Methods of the Box Wood Leaf-miner (*Monarthropalpus buxi* Labon.)," by C. C. Hamilton, College Park, Md. (10 minutes.) Lantern.

The use of crude molasses as a sticker to entangle the adults as they emerge and during oviposition. This stage of the life history is stressed, thus making possible the control methods. "Blackleaf 40" also showed some promise during the emergence period, while fumigation with cyanide and carbon disulphide gave negative results.

"Injury to Structural Timber by Lepidopterous Larvæ," by T. E. Snyder, Washington, D. C. (5 minutes.)

"Life History Notes on the Carpenter Worm (*Prionoxystus robinia*) with a New Method of Control," by H. E. Burke, Los Gatos, Calif. (5 minutes.)

FINAL BUSINESS

Report of committee on auditing.

Report of committee on resolutions.

Report of committee on membership.

Report of other committees.

Nomination of JOURNAL officers by advisory committee.

Report of committee on nominations.

Election of officers.

Miscellaneous business.

Fixing the time and place of next meeting.

Final adjournment.

WILMON NEWELL, *President*,
Gainesville, Fla.

A. F. BURGESS, *Secretary*,
Melrose Highlands, Mass.

JOURNAL OF ECONOMIC ENTOMOLOGY

OFFICIAL ORGAN AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS

VOL. 13

FEBRUARY, 1920

No. 1

Proceedings of the Thirty-Second Annual Meeting of the American Association of Economic Entomologists

The thirty-second annual meeting of the American Association of Economic Entomologists was held in the Girls Gymnasium, Soldan High School, St. Louis, Mo., December 31, 1919, and January 1 and 2, 1920.

The meeting was called to order at 10.20 a. m., December 31, by President W. C. O'Kane, and the annual reports and preliminary business was transacted during that session. In the afternoon of the same day, a program of papers was presented and the annual address of the President was delivered at 2.30 p. m. On the same evening, the Section on Apiculture held its meeting when papers were presented and three reels of moving picture films were exhibited. The Association resumed its sessions on Thursday morning, January 1, and in the afternoon the Section on Horticultural Inspection presented its program.

On Thursday evening a dinner was held at the Missouri Athletic Club, at which over eighty entomologists were present. At the close of the dinner President O'Kane introduced Dr. Howard who presided in a very agreeable way. He read a letter that he had recently received from Dr. Josef Jablonowski, from Budapest, which was a pleasant surprise to all the members present. He also introduced past presidents Forbes, Osborn, Marlatt, Felt, Britton, Parrott and Ball, who responded with appropriate remarks.

Mr. Arthur Gibson, the only entomologist present from Canada, was called on and made an appropriate response.

The occasion throughout was a very pleasant one for all the members.

The Association program was continued on Friday morning, January 2, and in the afternoon papers were presented and the business session was held.

The business proceedings form Part I of this report and the addresses, papers, and discussions Part II.

The proceedings of the Section on Apiculture and on Horticultural Inspection will be prepared and published by the Sectional Secretaries as part of this report.

PART I. BUSINESS PROCEEDINGS

The meeting was called to order by President W. C. O'Kane, at 10.20 a. m., Wednesday, December 31, 1919. About 150 members and visitors attended the sessions. The following were present:

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|---|---|
| C. N. Ainslie, Sioux City, Iowa. | R. W. Harned, Agricultural College, Miss. |
| George G. Ainslie, Knoxville, Tenn. | Leonard Haseman, Columbia, Mo. |
| R. H. Allen, Boston, Mass. | W. P. Hayes, Manhattan, Kan. |
| William J. Baerg, Fayetteville, Ark. | T. J. Headlee, New Brunswick, N. J. |
| E. D. Ball, Ames, Iowa. | Glenn W. Herick, Itasca, N. Y. |
| G. G. Becker, Fayetteville, Ark. | E. J. Hoddy, Knoxville, Tenn. |
| G. M. Bentley, Knoxville, Tenn. | H. E. Hodgkiss, State College, Pa. |
| S. W. Bilsing, College Station, Texas. | W. A. Hoffman, Washington, D. C. |
| R. A. Blanchard, Webster Groves, Mo. | W. E. Hoffmann, Lawrence, Kan. |
| W. E. Britton, New Haven, Conn. | W. J. Holland, Pittsburgh, Pa. |
| A. F. Burgess, Melrose Highlands, Mass. | W. O. Hollister, Kent, Ohio. |
| S. C. Candler, Carbondale, Ill. | J. L. Horsfall, Dubuque, Iowa. |
| R. N. Chapman, Minneapolis, Minn. | J. S. Houser, Wooster, Ohio. |
| LeRoy Childs, Hood River, Ore. | L. O. Howard, Washington, D. C. |
| T. D. A. Cockerell, Boulder, Colo. | H. B. Hungerford, Lawrence, Kan. |
| Mel T. Cook, New Brunswick, N. J. | H. G. Ingerson, Columbus, Ohio. |
| E. C. Cotton, Columbus, Ohio. | Dwight Isely, Washington, D. C. |
| J. J. Davis, Riverton, N. J. | V. L. Kellogg, Washington, D. C. |
| George A. Dean, Manhattan, Kan. | E. G. Kelly, Manhattan, Kan. |
| M. L. Dean, Olympia, Wash. | C. H. Kennedy, Columbus, Ohio. |
| O. D. Deputy, Laredo, Texas. | H. H. Kimball, Agricultural College, Miss. |
| E. H. Dusbam, State College, Pa. | J. L. King, Harrisburg, Pa. |
| E. P. Felt, Albany, N. Y. | E. J. Kraus, Madison, Wis. |
| H. L. Flaskler, Knoxville, Tenn. | J. M. Langston, Agricultural College, Miss. |
| W. P. Flint, Urbana, Ill. | W. H. Larrimer, West Lafayette, Ind. |
| S. A. Forbes, Urbana, Ill. | F. H. Lathrop, Corvallis, Ore. |
| S. B. Fracker, Madison, Wis. | R. W. Leiby, Raleigh, N. C. |
| B. B. Fulton, Corvallis, Ore. | R. N. Lobdell, Agricultural College, Miss. |
| Arthur Gibson, Ottawa, Canada. | Stewart Lockwood, Agricultural College, N. D. |
| P. A. Glenn, Urbana, Ill. | C. L. Marlatt, Washington, D. C. |
| James C. Goodwin, Gainesville, Fla. | J. W. McColloch, Manhattan, Kan. |
| H. A. Gossard, Wooster, Ohio. | |
| J. E. Graf, Puente, Cal. | |
| Saful A. Graham, St. Paul, Minn. | |
| D. W. Grimes, Agricultural College, Miss. | |

- C. L. Metcalf, Columbus, Ohio.
 Z. P. Metcalf, West Raleigh, N. C.
 J. H. Montgomery, Gainesville, Fla.
 Edna Mosher, Albuquerque, N. M.
 Henry Ness, Ames, Iowa.
 Wilmon Newell, Gainesville, Fla.
 F. M. O'Byrne, Gainesville, Fla.
 W. C. O'Kane, Durham, N. H.
 Herbert Osborn, Columbus, Ohio.
 Raymond C. Oshurn, Columbus, Ohio.
 F. B. Paddock, Ames, Iowa.
 H. R. Painter, Webster Groves, Mo.
 J. R. Parker, Bozeman, Mont.
 R. R. Parker, Bozeman, Mont.
 P. J. Parrott, Geneva, N. Y.
 Edith M. Patch, Orono, Me.
 L. M. Peairs, Morgantown, W. Va.
 F. C. Pellett, Hamilton, Ill.
 Alvah Peterson, New Brunswick, N. J.
 F. D. Pierce, Denver, Colo.
 W. A. Price, Lafayette, Ind.
 George H. Rea, Ithaca, N. Y.
 H. J. Reinhard, College Station, Texas.
 W. A. Riley, St. Paul, Minn.
 J. M. Robinson, Auburn, Ala.
 A. G. Ruggles, St. Paul, Minn.
 W. E. Rumsey, Morgantown, W. Va.
 V. I. Safto, Louisville, Ky.
 J. G. Sanders, Harrisburg, Pa.
 E. R. Sasscer, Washington, D. C.
 A. F. Satterthwait, Webster Groves, Mo.
 W. J. Schoene, Blacksburg, Va.
 E. E. Scholl, Austin, Texas.
 V. E. Shelford, Urbana, Ill.
 Franklin Sherman, Jr., Raleigh, N. C.
 F. L. Simanton, Benton Harbor, Mich.
 O. I. Snapp, Agricultural College, Miss.
 E. W. Stafford, Agricultural College, Miss.
 Frank Stirling, Gainesville, Fla.
 K. C. Sullivan, Columbia, Mo.
 M. H. Swenk, Lincoln, Neb.
 M. C. Tanquary, Manhattan, Kan.
 L. R. Taft, East Lansing, Mich.
 F. L. Thomas, Auburn, Ala.
 James Troop, Lafayette, Ind.
 W. R. Walton, Washington, D. C.
 H. R. Watts, Knoxville, Tenn.
 R. L. Webster, Ithaca, N. Y.
 C. A. Weigel, Washington, D. C.
 R. D. Whitmarsh, Milwaukee, Wis.

PRESIDENT W. C. O'KANE: The meeting will please come to order. We will listen to the Secretary's report.

SECRETARY A. F. BURGESS: Before reading the report, I would like to make a short statement which may be of interest to some of the members.

Sixteen years ago this Association met at St. Louis. This was the first year that the speaker acted as your Secretary. At that meeting, the records show that there were on the rolls 91 active, 43 associate and 41 foreign members, or a total membership of 175. The present membership is 566, which indicates how we have grown. At the St. Louis meeting sixteen years ago, 29 members were present. Today over 100 have registered.

REPORT OF THE SECRETARY

At the time of the Baltimore meeting, the total membership of the Association was 553; active 164, associate 340, and foreign 48. At that meeting, one active and four associate members resigned, and 53 were transferred from the associate to the active roll. During the year, 17 associate members have been dropped and one associate and one foreign member have died. Thirty-seven associate members were elected at the Baltimore meeting and one was reinstated. The present membership totals 566, and includes 216 active, 303 associate, and 47 foreign. The net gain for the year has been 13 members.

May 21, 1916, Prof. A. Porchinski, Minister of Agriculture, Petrograd, Russia,

died. He has been a foreign member of this Association for many years, but the news of his death was received recently.

On September 30, 1919, Patricio P. Cardin, an associate member of this Association, died as the result of an operation for kidney trouble. He was a graduate of the Massachusetts Agricultural College, and had been carrying on entomological work in Cuba for a number of years. His early death was deeply regretted by all those who were acquainted with him and the work which he was carrying on.

The Pacific Slope Branch of this Association held its fourth annual meeting at Mission Inn, Riverside, Cal., May 28, 1919. Forty-seven members and visitors were present. There was the largest attendance at this meeting of any that has been held by this branch. An excellent program was presented which is printed in full in the August number of the JOURNAL.

During the past year a number of copies of Banks index to the literature of Economic Entomology have been sold. The expenses in connection with this project have been very light, so that it has been possible to return \$200 to the Association fund. At the present time the index account owes the Association fund \$100, and if sales continue throughout the coming year, it should be possible to pay back this amount.

The honor roll of the members of the Association who served in the Great War was published in the February issue of the JOURNAL. Since that time the Secretary has been advised of two members whose names did not appear on that roll, namely: Albert Hartzell, who served in the United States Army, and George H. Corbett, who served as a Lieutenant in the British Army. It is regretted that the information was not at hand so that these names could have been placed on the original roll when it was published.

THE JOURNAL OF ECONOMIC ENTOMOLOGY

At the Baltimore meeting, a special committee was appointed to consider the financial situation in connection with the JOURNAL. This committee reported that the JOURNAL should be kept at approximately the same size as during the previous year; that authority be given to use \$500 from the general funds of the Association, if this amount was necessary, and to secure contributions amounting to \$100, the same to be repaid in subscriptions to the JOURNAL in future years. These recommendations of the committee were adopted by the Association and it was voted that the price of the JOURNAL, beginning with the year 1920, be fixed by the executive committee of the Association. During the meeting, \$160 was subscribed by members for the JOURNAL fund. Of this amount, \$60 was paid in during the year, and advance subscriptions have been credited to each subscriber. The executive committee of the Association considered the financial condition of the JOURNAL early in the year, and voted to increase the price \$1.00 to all subscribers, beginning January 1, 1920.

During the year 1918, 494 pages were published in the JOURNAL; in 1919, 478 pages were printed. The subscription list has increased materially during the past year, and an unusually large number of back numbers have been sold. This is principally due to the fact that an increase of \$1.00 a volume on back numbers will go into effect on January 1, and because a considerable number of foreign subscribers have purchased back numbers.

During the year, the Secretary has transferred from the Association funds to the JOURNAL fund, \$250, and with the amount paid in by members who contributed at the last annual meeting, the funds have been sufficient to carry the JOURNAL through the year with a comfortable balance. The future of the JOURNAL would be assured and it would probably now be on a self-supporting basis were it not for the fact that the cost of printing has just been advanced 25 per cent. This is our largest single item of expenditure and an advance at this rate on our present subscription list means an increase in cost of production of at least 75 cents for each subscriber.

Owing to this condition and to the probability that further increases in cost of producing the JOURNAL may be made at any time without notice, it is recommended that authority be given to increase the price of the JOURNAL on or before July 1, 1920, if conditions during the first half of the coming year appear to make this course necessary. Any increase in rate during the year 1920, would, of course, not be effective until January 1, 1921.

ASSOCIATION STATEMENT

Balance in Treasury, December 10, 1918.	\$605.17	
By amount received from dues, 1919.	616.42	
By amount received from interest in Malden National Bank.	10.58	
By amount received from interest, Melrose Savings Bank.	14.60	
By amount received from interest \$100 Liberty Bond.	4.25	
By amount received from Index fund.	200.00	
Paid stenographic report of 1918 meeting.	\$113.78	
Buttons, 1918 meeting.	11.14	
Postage.	58.74	
Printing programs, etc.	81.25	
Telegraph and express.	7.28	
Expenses of membership committee.	3.90	
Expenses of Pacific Coast Branch.	22.45	
Transfer to JOURNAL account.	250.00	
Clerical work, Secretary's office.	49.00	
One-half salary of Secretary.	50.00	
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	\$647.54	
Balance, December 8, 1919.	803.48	
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	\$1,451.02	\$1,451.02
Balance deposited as follows:		
Melrose Savings Bank.	\$172.02	
Malden National Bank.	631.46	

JOURNAL STATEMENT

Balance in Treasury, December 10, 1918.	\$94.91	
By amount received from subscriptions, advertising, etc.	2,413.46	
By amount received from Association fund.	250.00	
By amount received from interest on bank deposit.	5.07	
By amount received from members, advanced payments.	60.00	
Paid for postage.	\$55.53	
Paid for insurance.	18.70	
Paid for printing.	1,828.52	
Paid for half-tones.	232.64	
Return on subscriptions.	19.73	
Salary, Editor.	100.00	
Clerical work, Editor's office.	75.00	
One-half salary of Secretary.	50.00	
Clerical work, Secretary's office.	50.00	
	<hr/>	
	\$2,430.12	
Balance, December 8, 1919.	393.32	
	<hr/>	
	\$2,823.44	\$2,823.44
Balance deposited in Malden, Mass., National Bank.	\$393.32	

INDEX STATEMENT

Balance in Treasury, December 10, 1918.....	\$46.92	
By amount received from sales to December 1, 1919.....	223.35	
Paid for cartons.....	\$19.85	
Postage.....	6.00	
Insurance.....	18.70	
Transfer to Association fund.....	200.00	
	<hr/>	
	\$244.55	
Balance, December 8, 1919.....	25.72	
	<hr/>	
	\$270.27	\$270.27
Balance deposited in Malden, Mass., National Bank.....	\$25.72	

SUMMARY

Balance on Index Account.....	\$25.72
Balance on JOURNAL Account.....	393.32
Balance on Association Account.....	803.48
One 4½ per cent Liberty Bond.....	100.00
	<hr/>
	\$1,322.52

Respectfully submitted,

A. F. BURGESS, *Secretary*.

On motion the report of the Secretary was accepted and the financial part referred to the auditing committee.

PRESIDENT W. C. O'KANE: I will now read the report of the Executive Committee.

REPORT OF THE EXECUTIVE COMMITTEE

EUROPEAN CORN BORER

Members of the Executive Committee have been actively interested in furthering efforts to secure from Congress adequate funds with which to prosecute the campaign against the European Corn Borer.

In this work your President felt it his duty to assist in whatever way lay in his power. With that intent he visited Washington several times in the early part of this year, in order to help set before Congressional committees the judgment of our Association as to the urgent need for adequate funds, and to further the efforts of the Bureau of Entomology to secure such funds. In carrying out this plan conferences were held with officers of the Bureau of Entomology and with members of the Senate and the House. A special meeting of the Senate Committee on Agriculture was arranged by means of which the resolution adopted by this Association at its last meeting, together with other information, was brought officially before the Committee and placed in the records. Through the joint efforts of your officers, with the American Plant Pest Committee, officers of the Bureau of Entomology and the Secretary of Agriculture, additional appropriations were set under way, but were lost in the filibuster which ended the Congress that adjourned last spring.

NATIONAL RESEARCH COUNCIL

• In February a communication was received from the National Research Council

asking the nomination of one of our members to represent this Association as a member of the Council in the Division of Biology and Agriculture.

With the approval of the Executive Committee the President nominated Mr. P. J. Parrott, as the Association's representative. Mr. Parrott accepted the appointment and has instituted measures of great interest and value to the profession.

It is recommended that the Association provide for regular and permanent representation on the Council by electing a member to serve as its representative for a term of three years, election for such term to take place at this meeting in the regular order, after nomination by the nominating committee.

SALARIES IN ENTOMOLOGY

The fact that most professional men whose income is in the form of a salary are hard pressed by the increased cost of living is too well recognized to need proof. The condition prevails through practically all salaried positions except those of a commercial nature.

Teachers and experimenters have probably suffered more than any other class through this unfortunate state of affairs. This is for several reasons. Their salaries were relatively low ten years ago, before the rise in costs began. They have necessary living and professional standards to maintain. Their work is of such nature that an outside income of a substantial character is not usually possible.

The actual increase in cost of living in the past five years cannot be set down in definite and final figures. This is in part because commodity prices vary in different parts of the country, in part for the reason that the proportion to which a given article enters into the living expenses of a family varies. The rise in price of these several different articles has been in different degree.

In a prior study that was made by your President in another capacity a year ago, a comparison was drawn between college salaries in general in 1898 and those of 1918; and a further comparison between commodity prices in those two periods. In arriving at living costs, information was asked of various economic authorities. The average of their statements indicated that the dollar which was worth 100 cents in 1898 was worth only 45 cents in 1918. The figures as to salary were secured by a request sent to college authorities. The result of this indicated that the average, reasonably competent head of department received approximately \$2,000 in 1898 and approximately \$3,000 in 1918. In other words in the course of that twenty-year period, living costs had increased considerably over 100 per cent while salaries had risen 50 per cent.

Taking a more recent period, for comparison and setting up on one hand the living costs of five or ten years ago and on the other hand those of the current year, it seems reasonable to state that for the salaried professional man the cost of living in that time has doubled.

In a discussion of this subject, recently printed and distributed by Harvard University in the course of its campaign for increased endowment, the following statements occur:

"The fact is that this ideal toward which Harvard has striven during nearly three hundred years is less likely now of attainment than ever before. Because of underpayment of the teaching staff, Harvard is threatened with the loss of some of her brilliant men and with increasing difficulty in replacing them with teachers of equal calibre.

"When a man becomes a teacher, he does not look forward to the accumulation of a fortune. His dominant motives are love of teaching and devotion to the aims of scholarship. He must, however, have a material basis for the realization of his ideal, namely, a competence sufficient to insure a living conforming to the modest

standards of academic life, the means of enjoying family life, and a reasonable provision for the assistants and the equipment necessary for the economic use of his time and energy."

The scale of salary prevailing in the Faculty of Arts and Science at Harvard University is given as follows:

Instructors, \$1,200 to \$1,500; assistant professors \$2,500 to \$3,000; professors \$4,000 to \$5,500.

The booklet issued by the University further says:

"On this salary basis teachers at Harvard with the highest scholarly attainments and with unusual teaching ability cannot afford to remain today unless they have private incomes or earn money by outside work.

"It is safe to say that 90 per cent of the teachers at Harvard cannot live, without personal sacrifice, on the salaries paid them for teaching.

"Harvard may expect loyalty from her teachers, but she should not expect economic martyrdom.

"The young scholars, who should be the professors of tomorrow, stand between two alternatives. One is three years of additional labor and a considerable investment before they can become Doctors of Philosophy and thus qualify as university teachers. The other is the world outside the college. . . . They see at the end of seven years of study \$1,200 a year, slow advancement and a station in the economic scale lower than waiters, policemen, chauffeurs or street cleaners."

The salary scale now prevailing at Harvard University, which is the subject of the above statements, is materially larger than that in effect in a large proportion of our colleges and universities or in our state or federal bureaus. Living costs in Cambridge, Mass., are approximately the same as those in some other localities and are larger than costs in the middle west and the far west. The condition of teachers and experimenters, as described in the Harvard publication, obviously applies in general elsewhere. The following letter is one among several received by your Executive Committee along with replies to their questionnaire:

"Since living costs have risen and neither state or federal service can or will pay enough to cover even a small part of this increased cost, there seems no other road open but to enter the commercial field. This presumes that one must be proficient in some other line or profession. But when a man can step into another line of work, at a salary larger than he can get after twelve years of successful work in his chosen line, it's time to wake up."

The present condition is, no doubt, as fully recognized by administrative officers as by the teachers and experimenters themselves. Such recognition is the basis of the efforts to raise large endowment funds now in progress in several of our universities. Unfortunately, it is not likely that such efforts can be duplicated in similar degree throughout all institutions that employ scientific men. In addition there are large numbers who are employed by various governmental and state departments.

The profession of entomology is sharing in the salary problem. The inevitable effect is to injure the profession itself in serious degree and to darken the horizon for the men who are engaged in it. Young men of promise are attracted to other lines of work. Capable men now in the profession leave it. Large numbers who have already spent a part of their lives in the profession find their energies scattered and their efficiency diminished. Furthermore, as the months passed during this current year commodity prices have increased instead of decreasing and the difficulty has grown increasingly acute.

In this state of affairs your Executive Committee desired to perform whatever service might helpfully and constructively assist toward a betterment of conditions for entomologists. With that intent and with the assistance of a special committee

a questionnaire was sent, in August, to all members of the Association. The purpose of this was to disclose accurately the condition of salaries throughout the profession and to solicit the judgment of members as to the amount of increases that should take place.

The questionnaires were returned by 260 men engaged in the profession of entomology. Geographically the replies represent forty states, the District of Columbia, the Dominion of Canada, Mexico, the Canal Zone and the Territory of Hawaii.

All replies were divided into three classes, as follows:

Class I. Men who are at the head of a department or important division of work. This includes department heads in colleges and experiment stations, state entomologists, chief state inspectors, and men in charge of divisions in the Bureau of Entomology and in the Dominion Service.

Class II. Men not officially the head of a department but responsible for an important and well-defined section of work. This includes associates in our larger departments. Under this is included, also, men employed by the Federal Bureau and in charge of sub-stations.

Class III. Men who are doing the work of assistants.

It is appreciated that the above divisions cannot be considered as definite lines of demarcation. Many assistants carry a large measure of responsibility. In each of the three classes the actual amount of responsibility and general nature of the work vary with different individuals.

Assuming the above classification and omitting a few replies from men who have lately changed their position or who could not be classified for other reasons, there are found to be sixty-seven replies in Class I, sixty-six in Class II and one hundred and fifteen in Class III.

Class I

Of the 67 men in this class 34 are doing teaching as a part or all of their work; 35 have experiment station duties; 32 are in state departments in whole or in part; 22 are in federal employ.

The average total compensation in this class, including house rent or other additional compensation prevailing in a few instances, is \$3,014.91.

The average annual vacation enjoyed by men in Class I is 27.6 days; 63 per cent of these men are allowed time in which to attend professional meetings, expenses being paid in varying degree or not at all; 29 per cent are permitted time in which to do graduate work. Four men receive full pay while doing such work. The rest receive half pay or none at all.

The average years of service spent by the men in this class in official entomological work is 18.6. The average years spent in their present position is 11.9. The average years of college preparation before taking professional position is 5.7 years.

Class II

In Class II, 66 replies are tabulated; 11 of these men are doing teaching; 17 are doing experiment station work; 10 are in state departments or are doing inspection service; 44 are in the federal service.

The average total salary received by men in Class II, including outside compensation, is \$2,069.73.

The average annual vacation allowed is 23.3 days. Of these men 22.7 per cent have opportunity to attend annual meetings, but only a part of these can draw their traveling expense on such attendance. In this group 10.6 per cent are allowed time for graduate work and of these one draws full pay while doing such work.

The average number of years that these men have been engaged in professional

work since completing their training is 10.4 years. The average number of years spent in present position is 6.4 years. The average number of years spent in college preparation is 5.4 years. The average minimum salary desired by men in this group is \$3,024.

Class III

One hundred and fifteen replies are included in the returns under Class III. Of these, 17 are doing some teaching; 24 are doing experiment station work; 36 are in state departments or inspection work; and 60 in the employ of the Federal Bureau.

The average total salary now received in this class is \$1,704.

The average annual vacation is 20 days. Of the men in this class 17.3 per cent are allowed time in which to attend annual professional meetings, but of these only four receive their expenses at such meetings. Leave of absence for graduate study is allowed to 13.9 per cent.

The average number of years that the men in this group have already spent in professional work is 6.7 years. The average length of time that they have occupied their present position is 4.1 years. The average length of time spent in undergraduate and graduate training is five years.

The average minimum salary desired by men in this group is \$2,419.

The committee recommends that the data herein set forth be delivered to the committee on resolutions for recommendation at the final session.

W. C. O'KANE,
A. G. RUGGLES,
H. J. QUAYLE,
E. C. COTTON,
W. E. BRITTON,
A. F. BURGESS,
Committee.

It was voted that the report of the Executive Committee be accepted and the recommendations be adopted.

PRESIDENT W. C. O'KANE: The next is the report of the Employment Bureau, which will be read by the Secretary.

REPORT OF ENTOMOLOGISTS' EMPLOYMENT BUREAU FOR YEAR OF 1919

AUBURN, ALA., December 24, 1919.

During the past calendar year the work of the Employment Bureau has reflected "after the war" conditions in many ways. Numbers of men who had been in army service returned to civilian life and a number of these sought the service of the Bureau in locating employment again. Many who are known to be "out of service" have failed to inform the Bureau of their new addresses and we are unable to get into communication with them again as we would like to do. In June, 1919, fewer of the newly graduated men enrolled than usual. Naturally there are many more calls for men who are starting work at comparatively low salaries than for the highly paid positions. The scarcity of men available in the lower class has, therefore, made it impossible for us to furnish names as desired by employers in a number of cases. Many of the men who would seem to be starting in entomological work indicate minimum salaries that they will consider which are much higher than has been the case in previous years. There are many indications that employers of entomologists must provide higher salary rates than formerly as is being done in most other professions and occupations.

During the year, 19 men have enrolled, of which number two are "re-enrollments" indicating that men who have received 10 references through the Bureau, although they have not been placed in a new position thereby, are so well satisfied that they wish to continue the services of the Bureau. Undoubtedly in very many cases the prospect of a new position has led to the offer of increased salaries to hold desirable men in the positions which they already occupied.

There are now about 70 names on the rolls of the Employment Bureau. During the year, at least four men have been placed in new locations through the work of the Bureau, and possibly others of whose appointments we have not been informed. Altogether 83 references have been given requiring considerable time and correspondence.

The balance of "cash on hand" has shown a slow but steady increase since the beginning of the Bureau work. Accordingly, I would ask the Association to take action indicating whether they desire to have a policy adopted of increasing the number of references given for one enrollment fee beyond the 10 now given for the fee of \$2, or if this seems to be a reasonable and satisfactory service, to decide whether, as a slight compensation to the person in charge of the Bureau, the sum of 10 cents per reference shall be set aside so long as, and *only when*, there shall be funds on hand to meet first and fully all other expenses incurred ordinarily in the conduct of the Bureau work. Hitherto the services of the men in charge have been given entirely gratis and only stenographic assistance has been paid for.

The financial statement is attached hereto:

Financial Statement for 1919

Receipts:

December 24, 1918, to cash balance on hand.....	\$43.30
To 19 enrollment fees at \$2.....	38.00
Total.....	<u>\$81.30</u>

Dishbursements:

By stenographic service (voucher 1).....	\$18.30
By postage (voucher 2).....	4.07
By stationery (voucher 3).....	2.00
Total.....	<u>22.37</u>

Balance, cash on hand, December 24, 1919.....	<u>\$58.93</u>
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(Note.—Check for cash balance is attached hereto and payable in case the Association desires to transfer the administration of the Bureau to any other party, as I would personally be glad to have done.)

Respectfully submitted,

W. E. HINDS, *In Charge*.

ST. LOUIS, Mo., December 31, 1919.

We, the auditing committee, have examined the report herewith submitted and find it correct.

E. G. KELLY,

J. S. HOUSER,

Auditing Committee.

MR. E. P. FELT: I think it would be desirable to accept the report with the modification that the modest compensation mentioned

be allowed and that the financial part be referred to the Auditing Committee.

A motion was made to that effect and it was so voted.

SECRETARY A. F. BURGESS: At the close of the report, Dr. Hinds stated that he would like to be relieved of conducting the Employment Bureau. For the information of the members, I will say that the director of the Employment Bureau is not elected annually by the Association, but serves without a definite term of office. It seems to me that as a matter of good policy, arrangements should be made for having a definite term of office for the director of the Bureau. This is no reflection on Dr. Hinds or his work, but simply a matter of good business policy. Possibly this could be referred to the committee on resolutions for adjustment.

PRESIDENT W. C. O'KANE: We will now hear the report of the Committee on Nomenclature.

REPORT OF THE COMMITTEE ON NOMENCLATURE

Out of the total number of common names of insects submitted to the committee by different members of this Society the following list has been prepared and recommended for consideration and adoption. A few of the names presented were not included by the committee for various reasons, perhaps the larger number being excluded on account of the use of the generic name as a common name.

In addition to the list of names submitted the committee makes two general recommendations for your consideration: (1) that the term *grasshopper* be substituted for *locust* when writing of any species of grasshoppers; and (2) that the term *aphid* be substituted for *aphis* when discussing any species of *aphids*.

The committee also recommends the adoption of the following changes in the names of two common pests:

Alfalfa leaf-weevil to alfalfa weevil—*Phytonomus posticus* Gyll.

Harlequin cabbage bug to Harlequin bug—*Murgantia histrionica* Hahn.

Finally, the committee recommends the publication in the Proceedings of the names in this list that are adopted together with all of the common names that have been presented in the ten previous lists:

- Argentine ant—*Iridomyrmex humilis* Mayr.
- Australian-pine borer—*Chrysobothris impressa* Fab.
- Banana root-borer—*Cosmopolites sordidus* Germ.
- Beautiful hickory-borer—*Goes pulchra* Hald.
- Black thread-scale—*Ischnaspis longirostris* Sign.
- Camphor thrips—*Cryptothrips floridensis* Watson.
- Carpenter worm—*Prionoxystus robiniae* Peck.
- Citrus black-fly—*Aleurocanthus woglumi* Ashby.
- Cocoonut mealy-bug—*Pseudococcus nipae* Mask.
- Cuhan-laurel thrips—*Gynaikothrips uzeli* Zimm.
- Elm horer—*Saperda tridentata* Oliv.
- Elm sawfly—*Cimbex americana* Leach.
- Elm leaf-miner—*Katiosphingia ulmi* Sund.
- Elm case-bearer—*Coleophora limosipennella* Dup.

Gall-making Maple-borer—*Xylotrechus aceris* Fisher.
 Globose scale—*Lecanium prunastri* Fonsc.
 Grass thrips—*Aphanothrips striata* Osb.
 Green shield-scale—*Pulvinaria psidii* Mask.
 Hickory bark-beetle—*Ecoplogaster (Scolytus) quadrispinosus* Say.
 Irrorate leaf-hopper—*Phlepsius irroratus* Say.
 Larch case-bearer—*Coleophora laricella* Hbn.
 Lilac-borer—*Podosevia syringae* Harris.
 Linden-borer—*Saperda vestita* Say.
 Locust-borer—*Cyllene robiniae* Forst.
 Mango seed-weevil—*Sternonchus mangifera* Fab.
 Meadow plant-bug—*Miris dolabratus* L.
 Mining scale—*Howardia biclavis* Comst.
 Papaya fruit-fly—*Toxotrypana curvicauda* Gers.
 Pineapple black-weevil—*Metamasius ritchei* Mar.
 Poplar borer—*Saperda calcarata* Say.
 Pyriform scale—*Pulvinaria pyriformis* Ckll.
 Red-banded thrips—*Heliothrips rubrocinctus* Giard.
 Saddled leafhopper—*Thamnottiz cistellarius* Say.
 Sericeous palm-weevil—*Metamasius sericeus* Ol.
 Six-spotted leafhopper—*Cicadula 6-notata* Fall.
 Sugar-maple borer—*Plagionotus speciosus* Say.
 Sweet-potato weevil—*Cylas formicarius* Fab.
 Twig girdler—*Oncideres cingulatus* Say.
 Two-lined chestnut-borer—*Agilus bilineatus* Web.
 West Indian fruit-fly—*Anastrepha fraterculus* Wied.

Respectfully submitted,

GLENN W. HERRICK,
 EDITH M. PATCH,
 Z. P. METCALF,
Committee.

Inasmuch as the recommendations in this report provided for the publication of all the common names of insects which had been adopted by the Association, a general discussion followed. It was voted that the list presented by the committee be adopted and the recommendations concerning the use of the word "grasshopper" instead of "locust" and the word "aphid" instead of "aphis," be approved and that this list combined with those names that had previously been adopted, be printed and copies reserved for sale.

PRESIDENT W. C. O'KANE: We will now hear the report of the Committee on Policy.

Mr. E. D. Ball presented the committee report. It was voted that this report be referred back to the committee to be presented in final form at the last session of the meeting.

PRESIDENT W. C. O'KANE: We will now have the report of the Committee on Entomological Investigations.

MR. GEORGE A. DEAN: In view of the fact that the Committee,

on Policy has made provision for a sub-committee on entomological research and standards, and since the Committee on Entomological Investigations find that after interviewing a number of the members of the Association, they believe that this sub-committee is in a position to handle this work, your Committee on Entomological Investigations has decided to make no report. In view of the facts your committee would like to suggest that the Committee on Entomological Investigations be discontinued. This report is signed by myself as chairman, and Messrs. P. J. Parrott and W. J. Schoene. I move that the report be accepted and the matter of discontinuing this committee be referred to the Committee on Resolutions for later report.

The motion was carried.

PRESIDENT W. C. O'KANE: I will now call for the report of the Committee on U. S. National Museum.

REPORT OF THE COMMITTEE ON U. S. NATIONAL MUSEUM

The following information has been gathered, carefully studied and approved by your committee.

CONCEPTION OF THE DUTIES OF THE NATIONAL MUSEUM

The duties of the National Museum in relation to entomology are, we believe, to act as:

1. A national repository for the insect collections, the primary goal being to have as complete a representation of the fauna of the North American continent as possible, but emphasis to be placed also on the completeness of the collections from the entire world for reasons noted later. The Museum should also be a national repository for types of American species.

2. An investigational institution where the staff, Bureau of Entomology workers, other entomologists and advanced students could be provided with ample and satisfactory rooms for investigations on insects.

3. An educational institution for the laymen. This would necessitate popular exhibits illustrating the variety of insects, and the importance of their relation to human existence and interest.

The duties are indirectly stated in the 1918 Report of the U. S. National Museum.

IMPORTANCE OF INSECTS IN NATURE STUDY

The importance of insects to nature study is evident to everyone. The enormous number of individual species in comparison with the number of species of other animals or plants, their wonderful and remarkable variations and adaptations, and their relations and interrelations to all nature are evidence of the need of a more general knowledge of insects among laymen. This is more evident to the practical entomologist who every day realizes, from personal contact, the value of a general and correct knowledge of insects to enable the individual to comprehend and apply control measures.

IMPORTANCE OF INSECTS FROM THE PURELY ECONOMIC POINT OF VIEW

Probably no other factor in nature is more closely related to human existence than are insects, with the possible exception of human diseases. The success or failure of

the fruit crop or of the wheat or corn crop may be and often is wholly dependent on the effectiveness of artificial or natural control measures. The prevalence of many human diseases is wholly dependent on the prevalence of one or another insect.

IMPORTANCE OF THE MUSEUM TO ECONOMIC, SCIENTIFIC AND POPULAR ENTOMOLOGY

The systematic study of insects is directly related to all phases of entomology, indeed the foundation of all insect studies is the classification. We must know the insect before deeply engaging ourselves with the problem. In the case of newly introduced insects early recognition is of greatest importance and this fact alone justifies the building up of a collection representative of the entire world. Federal, state, experiment station, and other entomologists throughout the country depend largely on the experts working in the U. S. National Museum for identifying insects, especially those little known.

FINANCIAL SUPPORT. The National Museum supports the Division of Insects to the extent of furnishing one associate curator and two preparators which amounts to an expenditure of approximately \$4,200. The Bureau of Entomology furnishes about fifteen entomologists and as many preparators, an amount approximating \$39,000, whose work consists primarily in keeping the collections of the various orders and determining the material for workers of the Bureau and for entomologists elsewhere. The funds furnished by the Bureau amount to about 7 per cent of their total income for general expenses, while the amount paid by the National Museum to the Division of Insects is only 1.4 per cent of its income for the preservation of collections.¹ For the past fiscal year the Museum was allotted \$300,000 for the preservation of collections. In general it might be assumed that each of the three departments of the Museum would get \$100,000. Certainly the Biological Department not less since the preservation of their collections is a larger item than the similar needs of the other two departments, and since there are seven divisions in the Department of Biology we should expect the Division of Insects to receive not less than one-seventh of the total income or \$14,285. On the basis of importance, from the standpoint of human interest, economically and otherwise and the needs of taxonomic work on insects this division should receive a much larger proportion of the funds available. In justice to the other divisions it should be added that the above comparison is made not to minimize the importance of any division. There is not a division of the Museum work which does not deserve all of the funds at present allotted and more.

NEEDS OF THE MUSEUM SUMMARIZED

From a study of the Insect Division of the U. S. National Museum and personal observations and facts offered by those in a position to know, your committee summarizes the needs of the Museum as follows, listed in the order of their importance:

1. More space for workers, including students as well as regular employees, and for the collections and popular exhibits. The Museum rooms are greatly crowded, the rooms are poorly lighted, and we are informed were marked "attic" on the architect's plans and were never intended for scientific work-rooms.

2. More custodians to care for the collections and to handle the large volume of material sent in for identification. Promptness in the identification of insects has a direct bearing on the prosperity of the country since delay may result in the secure

¹In addition to the salaries indicated the National Museum expends between \$1,000 to \$3,000 per year on cases, supplies, etc., bringing the total support to about \$7,000, but apparently this does not reduce the per cent of total income as the National Museum budget calls for a separate appropriation for "Furniture and Fixtures," and for "hooks."

establishment of a serious pest in some section of the country heretofore uninfested. There should be one institution in this country with a sufficiently large number of specialists to exert a very decided influence upon our systematic work, and the National Museum is the logical institution.

3. Entomologists should be assured of sufficient space and custodians to properly and permanently care for large and small donations of specimens and regulations which will be sufficiently rigid to prevent the loss or misuse of materials. It is known that the National Museum has not secured large and irreplaceable collections, because there was little assurance that they would be cared for to the best advantage and this condition is bound to continue and the Museum will not receive collections which would otherwise be bequeathed until the Museum is able to offer the necessary facilities and safeguards.

4. Popular exhibits, already alluded to, are essential to the popularity and success of any Museum aside from the reasons already advanced for such exhibits. There is need of several specialists to prepare entomological exhibits at least comparable with similar exhibits in the larger museums of the nation.

5. Funds should be available to purchase collections. Occasionally collections containing large numbers of types of American insects, or containing material otherwise difficult to secure are obtainable only by purchase.

6. A systematic effort should be made to have as complete a representation of the American fauna as possible. The present force is inadequate to consider such an effort.

7. Funds should be available to enable the employment of a regular collector or collectors for making collecting expeditions, first consideration to be given to completing the collections from the North American continent, but later this should be enlarged to include the entire world.

8. Proper and legitimate expansion of the Insect Division of the Museum calls for greater space and more satisfactory working quarters as already stated and with this very evident need in mind the future plans for the Museum should include the erection of a separate building for insects.

In conclusion your committee would urge entomologists to furnish the National Museum with types or cotypes of species described by them as well as duplicate representatives of groups being worked up, and to cooperate with the Museum authorities in every possible way. Your committee has every confidence in the ability of those in charge of the affairs of the Division of Insects, of the Department of Biology, and of the Museum itself, but it realizes further that they alone are powerless to institute the many needed reforms without the thorough cooperation, assistance and support of all entomologists and those interested in the welfare of entomology.

Respectfully submitted,

J. J. DAVIS,
V. L. KELLOGG,
E. P. FELT,
HERBERT OSBORN,
E. D. BALL, &
Committee.

MR. J. J. DAVIS: I would like to offer as a member of the committee, a resolution which I think has a direct bearing and should be considered at the same time that we consider this report. The reason we believe it is well to consider such a resolution is the fact that it is going to be impossible to secure results simply by approving a report

of any committee. It is essential that we get to work, every one of us, and do everything we can to urge better facilities at the National Museum.

Resolved, That owing to the urgent needs of the Division of Insects, U. S. National Museum, the Museum Committee be empowered to join with the Museum Committee of the Entomological Society of America in preparing and printing a concise conference report based on two above mentioned committee reports, this printed report to be used for publicity purposes.

Further resolved, That the National Research Council be informed of the needs of the National Museum and the importance of the Division of Insects to every phase of entomology and their consideration of this matter and their support be urged.

Further resolved, That entomologists in all states be urged to use their influence in impressing upon their national legislative representatives the importance of this matter; also that on account of the direct and important hearing of the museum work on economic entomology of the entire United States the members of this Association be strongly urged to secure the endorsement of the State Horticultural and Agricultural Societies.

After general discussion, it was voted that the report of the committee be accepted, and that it be authorized to prepare a statement to be submitted to the Association at the final business session.

PRESIDENT W. C. O'KANE: We will now have the report of the Committee on Index of Economic Entomology.

REPORT OF THE COMMITTEE ON THE PUBLICATION OF THE INDEX OF AMERICAN ECONOMIC ENTOMOLOGY

Carrying out the instructions of the last annual meeting, your committee arranged with Dr. L. O. Howard, chief of the Bureau of Entomology, for the compilation of the index for the years 1915 to 1919 inclusive, with a view of having it completed and published early in 1920.

Miss Mabel Colcord was detailed to take charge of this work and she estimates that there are now about twenty thousand references with presumably two to four thousand yet to be entered and a fair prospect of its being completed the latter part of January. Figuring on the basis of the 1905-14 index, this would mean a volume of approximately 250 pages, which agrees exactly with our estimate of a year ago.

The printer's charges for an edition of one thousand copies, 400 bound, of substantially the same character as the preceding volume, would be, at current prices, \$1,550 for a volume of 250 pages. There would be some expense for author's corrections, the proofreading, postage, etc. The total cost can hardly be less than \$1,800. We could not count, as with the preceding index, on selling more than 300 copies at the outset, though the probabilities are good that a large number could be sold within a five-year period.

The total cost of one thousand copies of the 1905-14 index, including the binding of three hundred (the remainder were held unbound until needed) was \$1,212.99. The advance subscription rate, limited to members and to be accompanied by a remittance prior to a stated date, was fixed at \$4.00 and after that the price was advanced to \$5.00 for domestic and \$5.50 for foreign subscriptions. There were 161 copies sold to advance subscribers and 58 additional to others prior to December 7 of that year. The receipts from sales amounted to \$928.49 (including \$15.51 which

remained in the index fund), leaving a balance against the work of \$284.49. Up to December 11, 1919, the sales for 1919 amounted to \$223.35. After paying for postage, insurance, cartons for shipping the books and returning \$200 to the Association fund, there is a balance of \$25.72 in reserve. The 1905-14 index fund still owes the Association \$100 and if the number of sales of this year can be duplicated in the next, the indebtedness of the index will be cancelled.

The committee recommends that it be continued to supervise the completion of the index manuscript and that the editorial board of the JOURNAL OF ECONOMIC ENTOMOLOGY be authorized in its discretion to proceed with the publication of the index and to fix, as heretofore, the conditions of sale, it being expected that the terms formulated will result eventually in full reimbursement of the Association.

Respectfully submitted,

E. P. FELT,
A. F. BURGESS,
W. C. O'KANE,
W. E. BRITTON,
W. E. HINDS,
Committee.

On motion it was voted to adopt the report.

SECRETARY A. F. BURGESS: The adoption of this report carries with it the publication of the next issue of the index. In order to carry this project through, it will be necessary to secure 300 paid subscriptions from members of the Association at \$4.00 each, in order to get a working fund sufficient to finance the undertaking. Before the last index was issued, 161 advance subscriptions were secured from members. It will be necessary to practically double this number in order to finance the new volume.

PRESIDENT W. C. O'KANE: I will call for the report of the Committee on Amendments to the Constitution.

REPORT OF THE COMMITTEE ON CONSTITUTIONAL AMENDMENTS

Careful consideration has been given to the proposed revisions of the Constitution, as published in the program of the thirty-second annual meeting of this Association. As the proposals involve a radical departure in the administration of the affairs of the Association, the committee is not now prepared to recommend the adoption of the proposed amendments. The committee wishes it understood that this action does not prejudice any efforts, either of a similar or different sort, that may be made in the future to promote the work of the Association as embodied in the original suggestions for the appointment of a Committee on Policy. The committee, moreover, desires to express its hearty approval of the underlying motives of the proposed revisions—to promote research, stimulate progress and encourage concentration of efforts. As the Committee on Policy has shown capacity to render great service along these lines as a standing committee and is accomplishing the ends intended, it is deemed unwise to introduce fundamental changes in the Constitution which might prove difficult to correct.

P. J. PARROTT,
GEORGE A. DEAN,
WM. A. RILEY,
Committee.

By vote of the Association the report of the committee was adopted.

PRESIDENT W. C. O'KANE: The chair will announce the following committees:

Nominations: E. C. Cotton, J. J. Davis, P. J. Parrott.

Resolutions: A. G. Ruggles, G. A. Dean, J. G. Sanders.

Auditing: E. G. Kelly, J. S. Houser.

Temporary representative to serve as a member of the council to the American Association for the Advancement of Science on account of the absence of Professor Gillette: S. A. Forbes.

PRESIDENT W. C. O'KANE: Is there any miscellaneous business?

MR. LEONARD HASEMAN: The Secretary of the Board of Agriculture is considering the desirability of reprinting the Riley reports. If the members of this Association, especially the younger ones, are interested in securing these reports, a resolution concerning them might help materially in having them published.

PRESIDENT W. C. O'KANE: As there is no motion, the matter will be referred to the Committee on Resolutions for consideration.

SECRETARY A. F. BURGESS: I would like to bring before the Association the condition in which we find ourselves in connection with the gipsy moth work in New England.

Our appropriations have remained stationary. Our problem has not decreased in size. Our expenditures have increased upon all items. Unless we have more money, we cannot do the volume of work that we should do. I have talked with Dr. Howard in regard to this matter, and he is favorably disposed to the proposal of having an additional appropriation of \$100,000 for the coming fiscal year. Unfortunately this amount has been dropped from the estimates. The increased cost in wages, supplies, etc., amounts to over 30 per cent and it will probably be necessary to increase still more before the end of another year. We are paying lower than normal rates at the present time. I understand that there is a possibility that a supplemental estimate can be put in, and I would like to interest the members of this Association in the matter because we are facing a crisis in this work.

PRESIDENT W. C. O'KANE: This matter will also be referred to the Committee on Resolutions.

At the Friday morning session, at the request of the President, First Vice-President Ruggles and Past President Osborn were requested to escort Dr. Howard to the platform, where he was introduced by the President as the newly-elected President of the American Association for the Advancement of Science. He responded as follows:

Mr. President and Fellow Entomologists:

I did not expect to be exhibited this morning. I, of course, am enormously gratified at the personal compliment which the council paid me in electing me president

of the Association, but aside from the personal compliment, there is something very much stronger. It means that, as a class among scientific men, we have been coming for a long time with increasing rapidity and that we have gained by our sound scientific work the confidence of our fellow workers in other branches of science. That means a great deal. It is one thing to gain public confidence, but down in the bottom of our hearts we want the confidence in the value of our scientific work and the perfection of our methods in men who are working with other and older branches of science. I think it is not me who is to be congratulated, so much as the whole group of entomologists, economic and pure. (Applause.)

MR. H. A. GOSSARD, one of the representatives of this Association on the council of the American Association for the Advancement of Science, stated that he had been endeavoring to go over the lists of the Association in order to arrange for the promotion of all of our members who are entitled to receive fellowships in the American Association for the Advancement of Science.

Mr. Gossard stated that it was quite a complicated task and that it would take considerable time, hence he doubted whether it would be possible to make an entire adjustment of the matter at the present meeting.

At the afternoon session, Friday, the closing business was transacted.

PRESIDENT W. C. O'KANE: I will call for the report of the Auditing Committee.

AUDITING COMMITTEE

St. Louis, Mo., December 31, 1919.

We, the undersigned, as auditing committee, have examined the accounts of the treasurer of the Association of Economic Entomologists of America, of the JOURNAL OF ECONOMIC ENTOMOLOGY, the Index of Economic Entomology, and of the Entomologist Employment Bureau and have found them correct in every detail.

E. G. KELLY,
J. S. HOUSER,
Committee.

It was voted that the report of the committee be adopted.

PRESIDENT W. C. O'KANE: You will now listen to the report of the Committee on Resolutions.

REPORT OF COMMITTEE ON RESOLUTIONS

Your Committee on Resolutions begs leave to submit the following report, which for clarity and convenience is separated under the following heads: *Resolved*,

(1) That we express our appreciation to the local committee composed of George T. Moore, Alexander S. Langsdorf, Augustus G. Pohlman, John W. Withers and John Wulfin, who had charge of arrangements in St. Louis for the thirty-second annual meeting of the Association of Economic Entomologists.

(2) That the Secretary be authorized to prepare a suitably engraved certificate to be presented to all living past presidents, and that this presentation be established as a custom for the future.

(3) That the Employment Bureau be discontinued, and that the money be returned to those registrants who have credit with the Bureau.

(4) That since the Committee on Policy has made provision for a sub-committee on entomological research and standards, the Committee on Entomological Investigations be discontinued.

(5) That a material advance in the scale of compensation of entomological workers is essential to the present and future welfare of this important branch of science.

That the following schedule of salaries is endorsed by this Association as reasonable compensation for efficient professional services in entomology:

A. *Chief Executive:* In administrative and technical charge of a major organization, involving extensive executive responsibility, and the determination and direction of broad policies and undertakings; salary \$7,500 and up.

B. *Department or Division Head:* In administrative and technical charge of a major division or department of an organization, involving full responsibility for its direction; salary \$4,000 and up.

C. *Associate, or Senior Assistant:* Under general administrative direction of a department or division head, and responsible for the technical direction of a considerable subdivision; salary \$3,000 and up.

D. *Assistant:* Under specific administrative direction and performing prescribed technical duties; salary \$1,800 and up.

That the Association and its members earnestly urge the adoption of the above schedule throughout the country.

(6) That active membership in our Association should be maintained as an honor due to high grade work and constantly maintained interest in the furtherance of our Association and its ideals. Unless such a high standard is maintained active membership will have no significance.

(7) That this Association unites with the Entomological Society of America in the publication and distribution of a concise conference report based on the reports of National Museum committees of the two associations, calling attention to the urgent needs for greatly increased facilities for the Division of Insects.

Further, that this need be communicated to the National Research Council with an urgent plea for council support in improvement of facilities for entomology.

(8) That since we feel it necessary to the best interests of this Association and the furtherance of economic entomology in the United States, that divisional heads in the U. S. Bureau of Entomology be present and take part in our annual meetings, the Department of Agriculture can well afford to grant leave of absence on full pay, and meet the expenses of such officials for such purpose, even if it is deemed necessary to curtail the present extensive travel of minor assistants.

(9) That the phrase in the motion which established the Committee on Policy at the thirty-first annual meeting, as follows: "The originating and directing of all policies of the Association and its various undertakings" be stricken out, for the purpose of clarity and to avoid repetition.

(10) That this Association heartily approves the proposed reprinting of the Riley Missouri Reports.

(11) That inasmuch as the further spread of the gipsy moth and the brown-tail moth is a menace to the agricultural, horticultural and forestry interests of the United States, and since cost of operation has greatly increased, and thus made it impossible to conduct the work against these insects with the appropriation now available, this Association favors an additional appropriation by Congress of \$100,000 for the Bureau of Entomology, to be devoted to this important work, and further, that this Association take every reasonable measure to support this appropriation.

(12) WHEREAS, The Federal Horticultural Board has, through its quarantine service, rendered valuable protection to the agricultural interests of the United States, and

WHEREAS, The present quarantine service of the Board is not at present adequate, because of insufficient funds, to properly safeguard the country against the importation of new pests, therefore, the American Association of Economic Entomologists requests Congress to appropriate and make available the sum of \$200,000 for the ensuing fiscal year, for the use of the Federal Horticultural Board in extending and developing an adequate port inspection and quarantine service at all ports of the United States, and that copies of this resolution be furnished to the chairmen respectively of the Agricultural Committees of the House and Senate, the Honorable Secretary of Agriculture and the Chairman of the Federal Horticultural Board.

(13) That this Association unite with the Phytopathologists, Horticulturists and other associations in full cooperation with the American Plant Pest Committee in its publicity and legislative efforts for the protection of America from destructive plant pests.

(14) That our Association representative to the National Research Council be an ex-officio member of our Committee on Policy.

(15) That the proposition of Prof. Frank R. Lillie, Chairman of the Committee on Cooperation and Coordination of the Division of Biology and Agriculture of the National Research Council, urging this Association to cooperate with the National Research Council, be referred to our Committee on Policy with power to act.

A. G. RUGGLES,
G. A. DEAN,
J. G. SANDERS,
Committee.

The resolutions were adopted unanimously and without comment, with the following exceptions:

Resolution 3 on discontinuing the employment bureau was discussed briefly and was adopted by a vote of 22 for, 9 against.

Resolution 5 was discussed briefly and the point was made that the adoption of this resolution might have a bad, rather than a good effect, in bringing about increased compensation for entomologists. It was adopted, however, without change.

Resolution 7 was discussed briefly, the point being made that some men in the United States Bureau of Entomology did not attend the meetings of this association because they could not obtain proper authorization from the Department of Agriculture.

PRESIDENT W. C. O'KANE: Is the Committee on Membership ready to report?

REPORT OF THE COMMITTEE ON MEMBERSHIP

Your committee has given careful consideration to the matters before it, and begs leave to submit the following report:

It recommends that the fifty-one applicants be elected to associate membership as follows:

Anderson, Charles S., Arlington, Mass.
Armitage, H. M., Alhambra, Cal.

Babcock, Kenneth W., Arlington, Mass.
Bailey, Harold L., Bradford, Vt.

- Bauer, Frederick, Storrs, Conn.
Blanchard, Ralph A., Webster Groves, Mo.
Brock, A. A., Santa Paula, Cal.
Chamberlain, Kenyon F., New Haven, Conn.
Chambers, Ernest L., Washington, D. C.
Cook, William C., Univ. Farm, St. Paul, Minn.
Craig, Dexter H., Arlington, Mass.
Dean, M. L., Olympia, Wash.
De Ong, E. R., Davis, Cal.
Deputy, O. D., Laredo, Texas.
Eyer, J. R., Girard, Pa.
Fackler, Harry L., Knoxville, Tenn.
Grimes, D. W., Agricultural College, Miss.
Gunderson, A. J., Cleveland, Ohio.
Hoddy, E. J., Knoxville, Tenn.
Hodson, Benjamin E., Arlington, Mass.
Hofer, C. E., Arlington, Mass.
Hoffman, William A., Washington, D. C.
Hoffmann, William E., Lawrence, Kan.
Horsfall, J. L., Dubuque, Iowa.
Kennedy, Clarence H., Columbus, Ohio.
Kimball, Hunter H., Agricultural College, Miss.
Knapp, C. W., Arlington, Mass.
Lobdell, Richard N., Agricultural College, Miss.
Lockwood, Stewart, Agricultural College, N. D.
McIntyre, Henry L., Melrose Highlands, Mass.
McMahon, E. A., Annapolis Royal, N. S.
Montgomery, J. H., Gainesville, Fla.
Mosher, Edna, Albuquerque, N. M.
Nickels, Clarence B., College Park, Md.
Nininger, Harvey H., Winfield, Kan.
O'Rourke, Francis L., Arlington, Mass.
Palmer, Ralph G., Ithaca, N. Y.
Partridge, Newton L., Newark, Del.
Price, Walter A., La Fayette, Ind.
Ressler, I. L., Ames, Iowa.
Searls, Edward L., Schaghticoke, N. Y.
Simmons, Perez, Alhambra, Cal.
Smith, Ralph H., Twin Falls, Idaho.
Spencer, Herbert, West Raleigh, N. C.
Stirling, Frank, Gainesville, Fla.
Taft, L. R., East Lansing, Mich.
Taylor, Leland H., Boston, Mass.
Warren, Don C., Valdosta, Ga.
Watts, H. R., Knoxville, Tenn.
Whitcomb, Warren D., Yakima, Wash.
Winchester, Harry I., Wakefield, Mass.

A circular letter was sent to each of the associate members asking those who have not already done so, to file with the membership committee, data regarding their training and experience, list of publications, and, where possible, a copy of each, so that the members of this committee may have more adequate information about the work that our associate members are doing, with a view to possible promotion to active membership. Of the 303 associate members, 161 or 53 per cent have filed statements, and 44, or 14 per cent have sent publications. The committee again asks the associate members to file such information for the future use of the committee.

Several letters have been received from associate members, criticising the policy of the Association in regard to promotions to active membership. In explanation of this policy, the committee wishes to again point out that for several years an arrangement has existed whereby all active members are eligible to be made Fellows in the American Association for the Advancement of Science, without the necessity for further investigation.

In other words, active membership means something.

It should be borne in mind that this is an association of economic entomologists. All active members through their investigations and publications, or teaching, or control work, are supposed to have added to our knowledge of the subject. There are several systematists and workers in other lines of natural science on our list of associate members; men whose training, experience and achievement are of high order. Such members, so far as scholarship is concerned, would surely be eligible for promotion, but we cannot substitute some other line of endeavor in place of that for which this Association was formed.

Where associate members neglect to file statements or publications, your committee

is not always familiar with their achievements, and this should explain why they are not selected for promotion.

Furthermore certain associate members are in arrears on the secretary's books, and for this reason even though they fulfil all other requirements, are not recommended for promotion. Notwithstanding the present high cost of living, if a man wishes to be an active member in this Association, he must pay his dues.

Your committee believes that the following 31 men have fulfilled all requirements, and recommends that they be transferred from associate to active membership:

Abbott, W. S., Vienna, Va.	Pellett, F. C., Hamilton, Ill.
Barber, E. R., New Orleans, La.	Pemberton, C. E., Honolulu, H. T.
Bourne, A. I., Amherst, Mass.	Safro, V. I., Louisville, Ky.
Campbell, Roy E., Alhambra, Cal.	Scammell, H. B., Washington, D. C.
Chapman, Royal N., Minneapolis, Minn.	Severin, H. C., Brookings, S. D.
Childs, LeRoy, Hood River, Ore.	Severin, H. H., Berkeley, Cal.
DeLong, Dwight M., Harrisburg, Pa.	Shelford, V. E., Urbana, Ill.
Ferris, G. F., Stanford University, Cal.	Simanton, F. L., Benton Harbor, Mich.
Fink, D. E., Riverton, N. J.	Tanquary, M. C., College Station, Texas
Fracker, S. B., Madison, Wis.	Treherne, R. C., Vernon, B. C.
Freeborn, S. B., Berkeley, Cal.	Tucker, E. S., Tallulah, La.
Gill, John B., Monticello, Fla.	Weiss, H. B., New Brunswick, N. J.
Illingworth, J. F., N. Queensland, Australia.	Woods, W. C., Orono, Me.
Iseley, Dwight, Washington, D. C.	Yothers, M. A., Medford, Ore.
Leiby, R. W., Raleigh, N. C.	Zetek, James, Ancon, Canal Zone, Panama.
Newcomber, E. J., Portland, Ore.	

Three members have resigned from the Association, as follows: Charles J. S. Bethune (Active), Guelph, Can.; E. B. Engle (Associate), Harrisburg, Pa.; W. E. Evans, Jr. (Associate), Knoxville, Tenn.

Professor Bethune was one of the original members of this Association. The high cost of living is given as the reason for his request. As there is ample precedent for such action in this Association, your committee recommends that he be kept on our rolls, and his dues be remitted; also, that the resignations of Messrs. Engle and Evans be accepted.

Mr. S. Marcovitch, an associate member who resigned a year ago, now asks to be reinstated, and your committee recommends that his request be granted.

The following entomologists are recommended for election to foreign membership: Charles K. Brain, Pretoria, South Africa; Gerald F. Hill, Townsville, N. Queensland, Australia; Rupert W. Jack, Salisbury, Rhodesia, South Africa.

As two associate members have paid no dues, and as nine active and thirteen associate members are in arrears, your committee recommends that the Secretary be instructed to inform such members that if they do not remit within the coming year, their names will be dropped from the rolls.

Respectfully submitted,

W. E. BRITTON,
T. J. HEADLEE,
E. R. SASSER,

Membership Committee.

By vote of the Association the report was accepted and the recommendations adopted, which carried with it the election of the members recommended.

PRESIDENT W. C. O'KANE: Are there other committees to report?

ENTOMOLOGY IN THE U. S. NATIONAL MUSEUM

The day has long passed when American scientific activities could be restricted to a narrow field. Whether we regard economic needs or intellectual development, we find ourselves compelled to consider the whole range of science limited only by our resources and the powers of the human mind. In the field of entomology this involves, among other things, access to adequate collections of insects, including not only those found in North America, but the species of the whole world. The leading European countries have long appreciated such needs, and have built up collections to which Americans have to make pilgrimages when engaged in comprehensive studies of insect groups. There is no reason why we should not possess facilities for work at least equal to those of any other country. We have the greatest resources of any nation at the present time, and certainly are not lacking in the ability to carry on the work.

The species of insects are far more numerous than those of any other groups of animals; in fact the described forms exceed those of all other groups combined. Very many of them are of supreme importance and interest to man, as destroyers of our crops, as carriers of the germs of disease, as enemies of injurious forms, or as sources of some of our most important economic products. All know the value of the silkworm or honey bee, but few realize the services of the host of parasitic insects, which keeps down the enemies of our crops, and without which agriculture would be impossible. All are aware that numerous insects are injurious to plants, but comparatively few know that many of the most harmful have been introduced from abroad. The greatest danger of our crops, or even to our health, may arise from insects accidentally brought from foreign countries through the operations of commerce. The San José scale came from Asia, the cottony eusilion scale from Australia. The gypsy moth, which has cost this country hundreds of thousands of dollars, is European. The cotton boll weevil, even more to be dreaded, invaded the United States from Mexico and Central America. For urgent practical reasons, therefore, as well as in order to complete and organize our knowledge we need to know the insects of all countries, and to have them represented in at least one American collection. This obvious requirement cannot be met without Congressional aid. The National Museum, under present conditions, cannot possibly develop an adequate policy of entomological development. The two prime obstacles are lack of sufficient curators and lack of space. The present force, even with the great aid afforded by the members of the Bureau of Entomology, cannot arrange and classify the collections already on hand, inadequate as some of these are. Some of the men work overtime and on holidays, while help is sometimes obtained from those not officially connected with the Museum, but all these activities lamentably fail to cover the whole field. The Museum should have enough expert curators to keep classified and in order every group of insects, and to furnish identifications and other aid to economic entomologists and other workers in every state. Should the curatorial force be supplied, however, they would be helpless in the present crowded condition of the department. There is hardly room to move around, and almost no space for new cabinets. The only way out seems to be through the erection of a new building of suitable size; fireproof, but not necessarily of any great architectural pretensions.

Granting the building and the curators, with suitable rules and arrangements to ensure the proper care of all the collections, what more should be demanded? Undoubtedly collectors and students would present or bequeath their materials on a scale previously unheard of, because of the great services they had received from the Museum and their confidence in it as a repository of types and the priceless specimens. This, however, would not suffice. Funds should be available for explora-

tions, within the United States and abroad, to discover insects hitherto unknown or unrepresented in the Museum.

With curators, building, and adequate collections, we are still confronted by another urgent need. The results of the work done must be made available to scientific men in every part of the country. This can only be brought about through the creation of adequate publishing facilities, insuring the reasonably prompt appearance of each work completed. At the present time authors hesitate to undertake large monographs not knowing when they will see the light of publicity, nor indeed whether they will ever do so.

Prepared by the committees to investigate conditions and needs of the United States National Museum,

Entomological Society of America

T. D. A. COCKERELL,
HERBERT OSBORN,
WILLIAM BARNES,
WILLIAM M. WHEELER,
J. G. NEEDHAM,

Committee.

American Association

Economic Entomologists

JOHN J. DAVIS,
VERNON L. KEOLOGG,
E. P. FELT,
HERBERT OSBORN,
E. D. BALL,

Committee.

MR. J. J. DAVIS: The committee recommends that this report be accepted and that copies be submitted to the authorities of the Museum and requests the aid of all entomologists in the distribution of this information.

Voted that the report be accepted and the recommendations be adopted.

PRESIDENT W. C. O'KANE: We have yet to hear from the Committee on Policy.

REPORT OF THE COMMITTEE ON POLICY

Your Committee on Policy, following its appointment at the last session, promptly organized, elected a chairman, and proceeded to a consideration of the problems confronting the Association.

A preliminary canvass of the members resulted in the presentation of twenty-two more or less distinct problems for discussion.

A second canvass, in which an attempt was made to agree on a few of the more important ones for immediate consideration, was not as successful but finally resulted in an agreement on the division of the subject matter between five subcommittees, each subcommittee to proceed with the discussion and selection of important subjects within its own field.

The fields and subcommittee assignments are given below, it being understood that the chairman was to be ex officio member of each subcommittee and that the president held the same relation to those subcommittees to which he had not been regularly assigned.

1. Education: Osborn, Dean, Pierce.
2. Insect Control: Felt, Sanders, O'Kane.
3. Organization and Coöperative Relation: Sanders, Burgess, O'Kane.
4. Research Problems and Standards: Dean, Osborn, Parrott.¹
5. Publications: Burgess, Pierce, Felt.

¹ Professor Parrott as the Association's representative on the National Research Council was asked to assist this subcommittee.

The committee, in studying the problems of entomological education, finds that there are two quite different fields to be considered. The first of these is the general teaching of the subject for the benefit of the general public whether in the public schools, colleges or extension courses. The second field lies in the training of specialists in entomology who are to be responsible not only for the instruction in this branch, but also for the imperatively necessary research which is to carry the subject beyond its present limits and to make secure its foundation in fundamental knowledge. The committee asks the assistance of all entomologists in its consideration of definite courses in entomology for the different needs. It also asks assistance in considering the desirability of fixing minimum standards of preparation, or the holding of a degree showing a certain amount of training in entomology, as a requisite to recognition as a professional entomologist.

Your committee recommends: 1. That all members of the Association be urged to give attention to the instruction now offered in secondary and rural schools in their respective localities to the end that the best possible instruction be secured under the conditions existing.

2. That extension entomology and the extension entomologist, in all institutions where such officers exist, be connected directly with the department including entomological instruction, in order to insure the closest agreement in the activities of the two fields of effort.

Through the subcommittee on research problems and standards, your committee is, at the present time, endeavoring to determine what are the major research problems and what should be the best method of attack. Your committee asks the aid and cooperation of research workers in arriving at a decision as to the problems of the greatest value or urgency. Your committee is cooperating with the National Research Council, through our representative, in the development of entomological research and its coordination with that of the allied sciences. Your committee is undertaking to stimulate cooperation and coordination in research activities upon insects of regional importance. It feels that efforts of this kind wisely and conservatively directed would result in the development of regional or group projects in which the determination of the factors needing investigation and the method of attack would largely be developed in group or regional meetings, and that conferences from time to time would tend to accelerate progress.

The subcommittee on insect control began activities as a special subcommittee on the European corn borer and was subsequently reorganized with a broader function. The corn borer problem, because of its urgency, has been given special attention. One or more members of the subcommittee have taken part in most of the recent meetings, hearings and conferences in relation to this pest and have cooperated with various agencies. The committee has supported efforts to secure appropriations commensurate with the magnitude of the project, and regrets that owing to a variety of causes a comparatively small sum was appropriated by Congress. It has doubtless rendered a valuable service in other directions, though it is difficult, in view of the cooperative character of its work, to definitely list what has been accomplished.

It is the opinion of this committee that the European corn borer must still be regarded as a most important and potentially very dangerous insect in spite of the fact that developments in eastern Massachusetts last fall showed considerably less injury than in 1918, and that in New York state but one generation, with very limited injury, developed.

Serious losses may be expected, in the opinion of this committee, in eastern Massachusetts as a rule, and if the pest becomes established in the corn belt, extensive injury may result.

Furthermore, it is held that the westernmost infestations, although sparse, are a greater threat to the corn crop of the country than the larger area in eastern Massachusetts and New Hampshire.

The committee favors an energetic effort by the general government to control and, if possible, eradicate these outlying infestations by a reasonable clean-up of the infested territory, supplemented by a large scale test of the efficacy of modified cropping and the early destruction of infested corn, especially in the very sparsely infested portions of this area.

The committee also recommends comprehensive measures in eastern Massachusetts to prevent an undue multiplication of the insect and a demonstration of the possibilities of controlling it by modifications in cropping and by the adoption of such other measures as may be practical.

Furthermore a federal quarantine is recommended, restricted as to area, and applying to corn on the cob and all other portions of the plant except shelled corn or milled grain and, if possible without serious commercial disturbances, the inclusion of other plants or plant products liable to be infested and commonly transported, such as broom corn, celery, chrysanthemums and gladioli except the hulbs thereof.

Since the efficacy of the above measures depends in a very large degree upon the closest possible coöperation between federal officials and the various state agencies, it is recommended that detailed plans for control work be formulated and made public as early as possible and used as a general guide, at least for operations in the infested territory.

It is further recommended that the secretary of agriculture be asked to reconsider the situation in view of the materially changed conditions resulting from investigations of the last few months, and that he be urged to request of Congress a special appropriation of \$1,000,000 to be immediately available for cleaning up the infested territories in the early spring along lines substantially as outlined above, and that the secretary be urged to advise Congress that an equal amount for corn borer work should be included in the Agricultural Appropriation Bill, this latter to be available for a continuance of operation during the next fiscal year.

In view of the probability of other potentially injurious insects becoming established in this country in spite of quarantine and other precautions, and owing to the practical difficulties of securing immediate and effective action after the discovery of such an infestation, the committee would urge the desirability of the Bureau of Entomology having an emergency or reserve fund commensurate with the importance of the project, to be used for incipient work against such pest or pests, it being expected that later operations would be contingent upon the preliminary investigations and field operations, and cared for, as in the past, by special authorization from Congress.

E. D. BALL,
W. C. O'KANE,
A. F. BURESS,
E. P. FELT,
HERBERT OSBORN,
W. D. PIERCE,
J. G. SANDERS,
GEORGE A. DEAN,
Committee.

On motion, the item in the report referring to proposed appropriation for the control of the European corn borer was amended by reducing the amount to be immediately available from \$1,000,000 to

\$750,000, and by striking out the request for a proposed appropriation of \$1,000,000 for the next fiscal year.

It was voted to accept the report of the committee as amended.

PRESIDENT W. C. O'KANE: Is the advisory committee ready to nominate officers of the JOURNAL for the ensuing year?

MR. W. J. SCHOENE: On behalf of the advisory committee, I have the following report to make:

The advisory committee of the JOURNAL OF ECONOMIC ENTOMOLOGY nominates for editor of the JOURNAL OF ECONOMIC ENTOMOLOGY, E. P. Felt; for associate editor, W. E. Britton; for business manager, A. F. Burgess.

By vote of the Association the nominees were elected.

PRESIDENT W. C. O'KANE: Next we will have the report of the Committee on Nominations.

REPORT OF THE COMMITTEE ON NOMINATIONS

For President, Wilmon Newell.

First Vice-President, H. A. Gossard.

Second Vice-President (Pacific Slope Branch), E. M. Ehrhorn.

Third Vice-President (Horticultural Inspection Section), J. G. Sanders.

Fourth Vice-President (Apiculture Section), F. B. Paddock.

Member of the Committee on Policy, W. C. O'Kane.

Committee on Nomenclature, Arthur Gibson.

Committee on Membership, A. G. Ruggles.

Committee on U. S. National Museum, W. J. Holland.

For councillors to the American Association for the Advancement of Science, F. J. Headlee, G. A. Dean.

Advisory committee, JOURNAL OF ECONOMIC ENTOMOLOGY, L. O. Howard, L. W. Harned.

Representative on the National Research Council, P. J. Parrott.

Respectfully submitted,

E. C. COTTON,

J. J. DAVIS,

P. J. PARROTT,

Committee on Nominations.

By vote of the Association, the Secretary was instructed to cast the ballot of the Association for the nominees.

This was done and they were declared elected.

PRESIDENT W. C. O'KANE: I will request Past Presidents Britton and Felt to escort to the platform, President-elect Wilmon Newell.

MR. WILMON NEWELL: It is very difficult on an occasion of this kind to say very much. I am aware of the fact that you have conferred on me the highest honor that it is within your power to bestow. I am very deeply appreciative and I wish to assure you that I will give to the Association the best that I have, which is not very much, but

what is more important, I will try to get for you all that I can get out of somebody else. It is interesting to me that this has happened in the twentieth year of my entomological efforts. About all I can say now is that I hope all of you will be president of this Association by the time you have been at it twenty years.

PRESIDENT W. C. O'KANE: Is there any miscellaneous business?

SECRETARY A. F. BURGESS: A list has been passed around to secure subscriptions to the new index. The reduced rate of \$4.00 is for members only. If we extend this rate to institutions, we immediately get into trouble with subscription agencies that handle some of our business. Any member can subscribe for as many copies of the index as he desires at the \$4.00 rate, but he must pay for them personally, or if they are to be paid for by an institution, the order must state that they are for the use of a member, otherwise the full rate will be charged.

MR. J. G. SANDERS: I move that in the future we eliminate the purchase and use of numbered buttons. They are of some expense to the Association and about 20 per cent are usually used.

It was voted by the Association that this be done.

SECRETARY A. F. BURGESS: Inasmuch as we will have no more numbered buttons, I would like to ask if the Association cares to have the list of members and the list of meetings printed in the program. The program as printed with covers is more expensive than if the covers, list of members and list of meetings were eliminated. The list of members is printed largely because each member is numbered. I will take full responsibility for originating the button scheme and for printing the list of members, but I would like to know whether the association thinks the printing of this list is worth the price?

MR. J. G. SANDERS: I would like to see the list of members printed. It is very handy for reference at the meetings.

MR. E. C. COTTON: I would not like to see the list of members and list of officers and former places of meetings dropped.

By vote of the Association it was decided to print the program substantially as heretofore.

MR. H. A. GOSSARD stated that he had checked over the list of active members and that he had sent a list of those who were not fellows in the American Association for the Advancement of Science to that association so that they could be raised to fellowships, if they are in good standing on the books. He stated that he had done the best he could in the limited time at his disposal to straighten out this matter which proved to be quite complicated. He stated that he had attended many of the meetings of the council and was very glad to have had the privilege of voting for the first economic entomologist to be president of the general Association.

MR. HERBERT OSBORN: I move that the next meeting of the Association be held at the same time and place as that of the American Association for the Advancement of Science.

The motion was seconded and carried.

PART II. PAPERS AND DISCUSSIONS

Afternoon session, Wednesday, December 31, 1919, 1.30 p. m.

PRESIDENT W. C. O'KANE: The chair wishes to announce the matter of policy in regard to papers.

The time limit requested by the author will be allowed in each case and the time will not be extended unless by vote of the Association. If the author of a paper is not present when the paper is called, it will be passed to the end of the session. The papers left over will then be called in order. In the case of a paper sent in by a member who is not present, it will be read by title unless the Association votes otherwise. The chair believes that all members who attend the meetings and bring their papers should have preference over those who send them to the meeting.

I would like to announce an invitation to visit the Stark Bros., Nurseries and Orchards, at Louisiana, Mo.

We will now listen to a paper entitled, "New Facts Concerning the Habits of the Rocky Mountain Spotted Fever Tick, *Dermacentor venustus* Banks," by R. R. Parker.

THE PRESENT STATUS OF THE CONTROL OF DERMACENTOR VENUSTUS BANKS IN THE BITTER ROOT VALLEY, MONT., AND NEW DATA CONCERNING THE HABITS OF THE TICK¹

By R. R. PARKER, *Bozeman, Mont.*

During the past sixteen years much time and money have been spent by various agencies, both medical and entomological, in the study of Rocky Mountain spotted fever, its mode of transmission, and the habits and means of control of the wood-tick, *Dermacentor venustus* Banks, the transmitting agent.

Medical science has been more interested in the etiology and pathology of the disease and the possibility of finding a cure, than in the actual control, though a few men have labored in this direction. Dr. S. B. Wolbach of Harvard Medical School, working since 1916, has suc-

¹ Contribution from the laboratory of the State Board of Entomology, Bozeman, Mont.

ceeded in demonstrating the causative agent, an organism which he considers to belong to a new group of disease agents, that is, it is neither bacterial nor protozoan. He has worked out the life history of the organism in some detail, and has recently named it. No cure, however, has yet been discovered. Four medical men have thus far lost their lives in this work, three through accidentally acquired infection. The most recent death was that of Dr. Arthur McCray, director of the State Hygienic Laboratory, during the past summer.

Entomological workers were early brought into the field by the apparent fact that the best hope of controlling the disease lay in the control of the tick which transmits it. The work was first taken up by Prof. R. A. Cooley, and later by the Federal Bureau of Entomology. The life history of the tick, and eradication measures were first worked out and actual control was initiated in 1912, the Public Health Service also cooperating.

The area of operation has gradually been extended until it now involves approximately 125,000 acres. The two federal agencies, however, withdrew in 1917, and since then the work has been carried on solely by the Montana State Board of Entomology. That control efforts have met with some measure of success is attested by the facts that considerable areas have been freed of ticks and, whereas up to twenty-five or more cases a season were the rule, during the past two years there has been but a single case in the area where the work has been conducted. The reduction in cases is attributable in part to the control work, in part to education to avoid infection, and perhaps in part to little understood natural factors. There is some reason to expect a slight increase in the number of cases during the next few years, especially in certain areas outside the control districts.

The work of control, however, is a long and tedious operation, alike to those in charge, and to the local farmers and others involved, and two questions persistently present themselves. One concerns the permanency of the results attained, the other the possibility of finding some simpler and quicker method of operation.

Permanency of results is especially to be desired; but knowledge on this point is limited by lack of knowledge of the real source of the disease among wild mammals, among which, there seems no reason to doubt, lies the real source of the disease. The question cannot, therefore, be satisfactorily answered. Questions of the susceptibility, immunity, chronic infectivity, habitat, periodical variations in abundance and distribution, and the seasonal migrations and habits of these animals are all intimately involved. Even though we may successfully eradicate the tick, it is possible that the real condition which is the very bed-rock of the trouble may be left behind. For example let us sup-

pose that a certain rodent is the medium through which the disease becomes endemic. Then, since the distribution of most rodents and their relative abundance is largely dependent upon the distribution of certain types of vegetation favorable to them, the value of the eradication of ticks and even of the particular rodent involved, is limited by the very probable facts that a certain degree of tick reinfestation is very possible and that since the natural habitat of the rodent remains, reinfestation by this rodent would also take place, with the possibility, at least, of a recurrence of the disease. On the other hand, if this rodent were known, or it might be that more than one species would be involved, steps could perhaps be taken to prevent its reappearance. In the case of certain rodents, such a course would be entirely possible and the probability of future tick reinfestation would be of negative importance.

At the present time, the methods of tick control employed are rodent destruction (directed particularly against the Columbian ground squirrel); the restriction of grazing; dipping and hand picking of stock; quarantine and cultivation. Under these measures, the minimum time to expect apparent results is three seasons, and complete eradication will take from five years on, depending upon the degree of coöperation obtained from the residents and the thoroughness with which the state can carry out its end of the control program. Hence, the chance that there may be some simpler means of solving the problem than those now in use is not only an inviting field for research, but also a very pertinent question at the present time, when there is the probability that it will be necessary to extend the work over a greatly increased area. This possibility immediately directs attention to the fact that methods of *tick control* depend upon local conditions, so that to secure the best results, variations in method, from place to place, are quite essential. The conditions which make such variations necessary are: differences in the hosts of the larval and nymphal ticks, differences in the hosts of adult ticks, differences in economic conditions, differences in the character of the vegetation and soil covering which predetermine the species and the relative abundance of the rodent hosts of the immature ticks, and finally differences in the habits of ticks, which often show considerable variation with short distances. Space does not permit that these factors be discussed, nor is it necessary, except to point out that a further expansion of the work would mean the working out of a system of control varied here and there, to adapt it to local conditions. This is a difficult thing to do, especially in a farming community. As an alternative is the possibility of finding a simpler way of checking the fever, that is, one of more general application. The latter step

has more to recommend it, and the writer believes that such a plan may be evolved by a study of disease among the wild animals, with the end in view, of eradicating from any area concerned, those rodents or other animals which permit the disease to perpetuate itself. Such an investigation has been carefully planned, and a mass of circumstantial evidence already at hand indicates the possibility that the rodents or other animals which it may be necessary to exterminate will be very few in number. If this be so, the work will eventually resolve itself into a systematic campaign against certain species of animals, and will be aimed at the actual source of the disease rather than at the control of the transmitting agent, a long process at best, desirable though it may be. Such a program would have much to recommend it over the present system of control,—it would be more rapid, more effective and less expensive; it would eliminate features of the present system which are a source of constant irritation to a certain class of residents, and under some conditions, the reduction of ticks would be fully as marked as under the present system.

DATA CONCERNING HABITS OF *DERMACENTOR VENUSTUS* BANKS

In spite of time which has been devoted to the study of the habits of the tick, the writer feels that knowledge of the latter is limited, and that additional study would reveal points of value. Our knowledge of larval and nymphal habits, in particular, is extremely meagre, and those of the adult tick are by no means well known or understood. The remainder of this paper, therefore, will be devoted to the presentation of a few points which the work of the past few seasons has brought out.

TICK MIGRATION.—It has always been supposed that the movements of the adult spotted fever ticks were of very limited extent, but while carrying on studies in eastern Montana in 1917, conditions were encountered which led the writer to believe that such was not the case. Subsequent observations have confirmed this opinion. Conditions which first suggested the idea of tick migration were found in a hilly area, cut by narrow valleys from which still narrower much-branched coulees extended back into the hills on either side. The floors of the coulees varied from a few feet to several hundred feet in width, and in the middle was always a rather narrow draw which remained green and moist until late in the season. Each side of the floor gave way to a short and usually steep slope surmounted by sandstone rimrocks. Weathered rocks from the cliffs had accumulated at their bases and on the slopes below. In the clefts of the rimrocks and among the fallen rocks, deer mice, chipmunks, pack rats and cottontail rabbits,

the rodents which were found to be hosts of the larval and nymphal ticks, were found. Hence it would be supposed that this was the place the adult ticks would occur, and during the early spring months they were found in such places, in considerable numbers. In June, on the other hand, the ticks were scarce on the slopes, but abundant in the draw. At this time the slopes had become dry, but the draw at the bottom was moist, and the vegetation green and abundant. For example, in a certain coulee known as Wolf Den Coulee, which was about half a mile in length, the floor gradually narrowed from a width of about one hundred feet at its mouth, to a few feet at the upper end. On May 18, operations on the floor of the coulee failed to reveal any ticks, though they were found in abundance on the slopes at the blind end. On June 19, however, numerous ticks were "picked up" the whole length of the floor. In another coulee in which the draw was but from one to three feet wide, nearly two hundred ticks were secured in late June by dragging but a few hundred feet up the draw. Their absence here, and their abundance on the slopes above early in the season had been noted in previous operations. Similar conditions were encountered in widely separated localities. The improbability that the ticks had been dropped in these bottoms as engorged nymphs was shown by the fact that the hosts of the immature ticks inhabited not the draw, but the slopes above. The only reasonable explanation seemed to be that the ticks had gradually migrated downward, and concentrated in the bottoms. What the compelling factor was would be hard to say, though the possibility that they had migrated from the dry slopes to the moist bottoms was naturally suggested. The writer has met with similar movements in other localities however, when the moisture factor seemed to be absent. It is of interest to inquire as to what becomes of the ticks migrating to the bottoms. They were certainly not numerous there in the spring in which this work was conducted, but there is nothing to explain their absence, or to suggest that they might not have been numerous the following spring, except the fact that these draws are usually filled by rushing torrents in the early season, and very wet for some time thereafter. It is well known that this tick avoids wet places, and is not normally found there.

In 1918, when the writer took up the control work in the Bitter Root Valley, a few experiments were conducted, to see if migration actually occurred. For one experiment, a slope to the north of Big Creek near Victor, was selected. A certain trail on this slope had long been known to be heavily infested, the ticks always being found on the vegetation growing along the upper edge of the trail. Even before going to the Bitter Root Valley, my observations noted above had suggested the possibility that ticks migrated down the slope, and stopped when they

reached the trail. To prove or disprove this possibility, one hundred ticks, marked with white paint, were liberated one hundred feet above the trail on May 3, all at the same point. Unfortunately, it seemed, at the time, this whole area was burned over on May 4. One of my assistants, however, when going up the trail on May 23, found three of these marked ticks along the upper edge of the trail, these ticks having survived the fire and moved downward. The places were carefully marked, and we returned the next day, and again found the ticks, though they had changed their position up or down the trail. The two outermost were more than two hundred feet apart.

A similar experiment carried on in another place with two hundred ticks showed that a majority of ticks tend to migrate down a slope and that very few go up. Some, however, remained near the point of release during two successive seasons, 1918 and 1919. None were found more than twenty feet up the slope, nor more than two hundred and fifty feet down the slope.

The tendency of ticks to concentrate along a trail or road crossing a slope, or along the edge of cultivated land similarly situated has been observed in numerous instances, the details of which need not be recorded at this time.

As a further proof that these adult ticks move about, it may be mentioned that we often removed all the ticks from a tuft of grass on the edge of Big Creek trail, mentioned above, only to find it again infested on our next trip. The writer has also seen ticks drop from a grass blade or bush and deliberately move toward a person standing nearby.

Though the observations thus far made have only been of a preliminary nature, they have been sufficient to indicate that ticks do move about, and that the tendency when on a slope is to migrate downward, and that migration is hindered when the low vegetation is at all abundant. Under certain highly localized conditions, this fact has valuable application to control work. Other applications to the whole general problem may develop as a better knowledge is gained of the movements and the factors which control them.

A REACTION OF ENGORGED SEEDS TO LIGHT

Prof. R. A. Cooley determined some years ago that engorged immature ticks dropped from their host during daylight. During August of the past season, while feeding seed ticks on a cottontail rabbit, a chance observation developed the further fact that the rapidity of dropping could be increased or decreased by varying the degree of light intensity. By placing the infested animals in darkness dropping could be stopped, while by increasing the light intensity, the rate of dropping could be

increased, reaching its height when the animal was placed in direct sunlight.

This fact was determined in the following manner: A cottontail rabbit had been heavily infested with seeds. When they had become engorged and started to drop, a record was kept of the number dropped during each successive fifteen minute interval, the experiment having been originally started to determine at what time of day the majority of ticks dropped. After the count had been kept for several hours, it was noted that the intervals showed alternate high and low counts. The figures were too consistent to be due to chance, and an explanation was sought. The work was being conducted in a shed. The ticks, as they dropped, were being caught on two pieces of outing flannel used alternately. It was observed that one cloth was located in a patch of sunlight, which came through the shed door, the other in the shade. The high counts were from the cloth placed in the patch of sunlight. Varying the conditions from complete darkness to direct sunlight, it soon established the conclusions recorded above. It is probable that the same reaction to the intensity of light also determines the time of dropping of the engorged nymphs. In this connection a consideration of the habits of those rodents which are hosts of larval and nymphal ticks, and which are also susceptible to the disease, may be of value in understanding the distribution of infected ticks and to a certain extent of the fever itself. The factors which enter into this problem would be the time of day at which these host animals are active, that is, whether nocturnal or diurnal, the particular conditions as regards habitat under which the various periods of the day are spent, and the extent of movements when active and the character of country then sought.

Other habits of interest might well be mentioned but time has limited the discussion to those which have a possible bearing on the distribution of infected ticks and the consequent relationship to the occurrence of infection in human beings.

PRESIDENT W. C. O'KANE: This paper is now open for discussion.

MR. LEONARD HASEMAN: I would like to ask the speaker whether in any of his work he has found any other species of tick that carry fever?

MR. R. R. PARKER: I have not found other species myself, but other investigators working under laboratory conditions have found other species that carry fever. There are other species, such as the rabbit tick, which should be worked with to determine whether or not they carry the fever.

PRESIDENT W. C. O'KANE: If there is no further discussion, we will now listen to the paper entitled, "The Ecology of Certain Insects Which Infest Stored Food Products," by Royal N. Chapman.

THE ECOLOGY OF CERTAIN INSECTS WHICH INFEST STORED FOOD PRODUCTS

By R. N. CHAPMAN, *St. Paul, Minn.*

(Withdrawn for publication elsewhere)

PRESIDENT W. C. O'KANE: The next paper is, "The Extermination of the Pink Bollworm of Cotton in Texas," by Ernest E. Scholl.

MR. E. E. SCHOLL: I will read my paper first, and if there is time I will read the paper by Dr. Hunter on the same subject.

I was detained in Austin, Tex., before coming here, where I had a conference with Dr. Hunter.

PRESIDENT W. C. O'KANE: We have adopted a procedure by which if a man is not present to read his paper, it goes to the end of the session.

SECRETARY A. F. BURGESS: I would suggest in this case that the paper of Dr. Hunter be read, because it forms a part of a symposium on insect extermination, and if these papers are not all presented together, the subject will be presented in a very disconnected way.

■ The Association voted that Dr. Hunter's paper be read by Mr. Scholl.

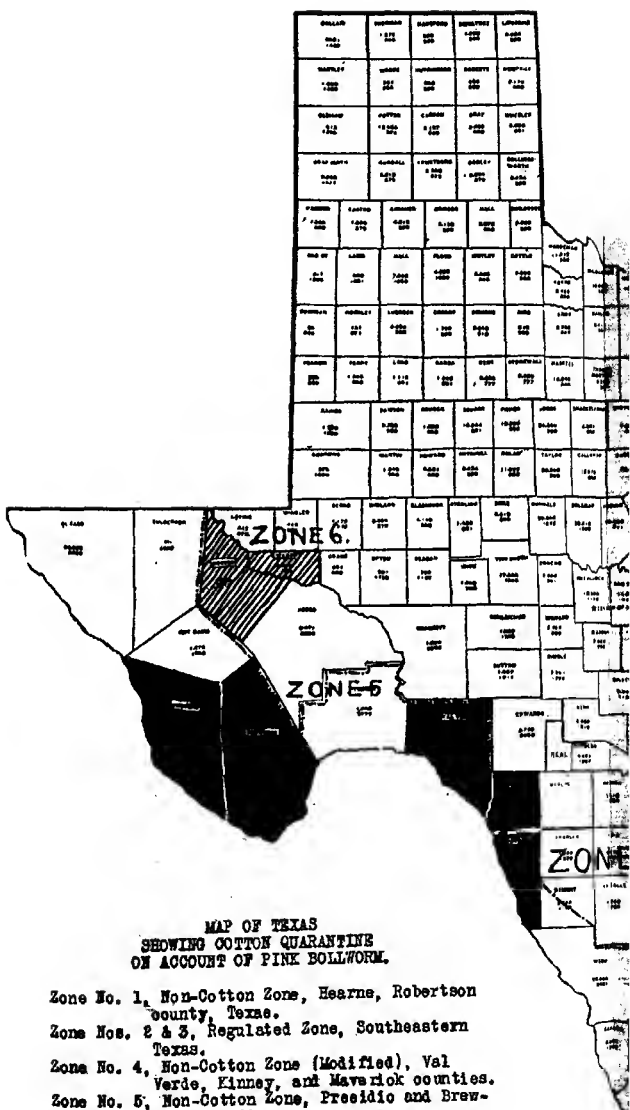
METHOD OF PROCEDURE IN PINK BOLLWORM ERADICATION WORK IN TEXAS

By ERNEST E. SCHOLL, *Chief Entomologist, State Department of Agriculture, Austin, Tex.*

According to the opinion of the writer, the best entomological legislation in the state of Texas was the placing upon the statutes of our state of the Pink Bollworm Act, passed in October, 1917, and improved by amendments in March of 1919 as House Bill 329 and now known as the Texas Pink Bollworm Act of 1919.

The Act is very specific, and although it deals with only one species of insect, it leads us to believe that in the near future the state of Texas, as well as other states, will use the act as a basis for the enactment of similar laws pertaining to other serious insect pests.

The provisions of the act are in the main two-fold. First, provisions are made for safeguarding against the introduction of the pink bollworm from Mexico. Second, portions of the law provide for strenuous measures in controlling and eradicating outbreaks of the pink bollworm that have already become established in the state.



MAP OF TEXAS
SHOWING COTTON QUARANTINE
ON ACCOUNT OF PINK BOLLWORM.

- Zone No. 1, Non-Cotton Zone, Hearnes, Robertson county, Texas.
 Zone Nos. 2 & 3, Regulated Zone, Southeastern Texas.
 Zone No. 4, Non-Cotton Zone (Modified), Val Verde, Kinney, and Maverick counties.
 Zone No. 5, Non-Cotton Zone, Presidio and Brewster counties.
 Zone No. 6, Regulated Zone, Ward and Reeves counties.

As a primary safeguard the legislature created a zone known by some as a "safety zone" and termed by others a "buffer zone," which consists of a tier of counties along the Rio Grande River, and provides for this safety strip of land in which it becomes necessary for the commissioner of agriculture to use special precautions in making inspections and surveys of cotton fields. Sections of the act following that portion which provides for the above zone makes it possible, under certain conditions, to safeguard the shipments of cotton products, and if necessary, prohibit the absolute growing of cotton. The procedure in establishing a non-cotton zone in this tier of counties consists mainly of the inspection of cotton fields in Mexico by federal men, and if pink bollworms are found within twenty-five miles of the Texas border such report, when received at Washington, D. C., is reported to the governor of our state by the secretary of agriculture, after which it becomes necessary for the commissioner of agriculture of Texas to verify the infestation. After this has been done and the report has been submitted to the governor of the state, he at once issues a proclamation creating a non-cotton zone consisting of such territory as may be deemed necessary to assure the prevention of the introduction of the pink bollworm into the state of Texas. It is under this section of the act that zone 4, consisting of the counties of Val Verde, Kinney and Maverick, has become a non-cotton zone since the spring of 1918 on account of the discovery of the pink bollworm at San Carlos, Mexico, about fourteen miles from the Rio Grande River, by federal officials in the fall of 1917, and verified by state officials in February of 1918. The present existence of the pink bollworm at San Carlos makes it necessary for the continuance of non-cotton zone No. 4.

Further steps are provided in the act for the commissioner of agriculture to prevent the shipping of cotton or cotton products from border zones, or to properly safeguard such shipments by fumigation before they are shipped.

The first steps necessary in the case of discovery of the pink bollworm within the state outside of the zone provided for in Section 1 are for the commissioner of agriculture, upon receipt of a sworn affidavit from an inspector to the effect that the worms have been found, to certify such fact to the governor, who then proclaims a special zone or quarantine district to such an extent as may be determined sufficient to prevent the spread of the pink bollworm, after which it is unlawful for any grower or any person to ship cotton products of any kind without special permission from the commissioner of agriculture. It is further provided that if in the judgment of the commissioner of agriculture the danger is of such nature that the cotton must be destroyed, such fact is also certified to the governor, who then proclaims such

cotton or fields of cotton a public menace, and authorizes the commissioner of agriculture to exercise his authority in complete destruction of such cotton or cotton plants. Immediately after the issuance of such proclamation steps are taken by state and federal officials in organizing clean-up gangs, whose work consists of the uprooting of all cotton plants and picking up of all waste cotton material and the destruction of all such plants and material by burning. Quarantines with these provisions were issued by the governor for zone 1 at Hearne in the spring of 1918; for zones 2 and 3 in the southeastern part of Texas in the spring of 1918, and for zones 5 and 6 in the western part of the state in the winter of 1918-19.

Should it become necessary for the commissioner of agriculture to destroy cotton fields in which considerable cotton is still unpicked, the act provides for the appointment of an appraisal committee by the county judge of the county in which the infestations exist.

This committee consists of three disinterested citizens, and their duty is to appraise, under oath, any cotton or cotton fields that must be destroyed. The appraisal report, approved by the county judge and certified to by the commissioner, upon the receipt of a certificate from the chief inspector in charge of the clean-up work that the fields and cotton have been destroyed, finally reaches the state comptroller whose duty it is to direct the State Treasurer to issue warrants to the growers for the amount due them on the cotton destroyed. Any grower who is not satisfied with the amount assessed by the appraisal committee has the right of appeal to any court of competent jurisdiction.

Unfortunately the state legislature did not set aside a specific sum of money by which such payments as called for above can be immediately paid. Steps are now being taken by the attorney general's department of the state with a view of having all such claims paid without legislative action.

The act also provides for the condemnation of cotton fields where a very light infestation of the pink bollworm exists. Under the provisions of this section the cotton is allowed to develop and is handled under specific directions of the commissioner of agriculture, is harvested under certain rules and regulations, and is marketed under restrictions. This section also provides that any extra services rendered by the grower of a condemned field in safeguarding the cotton is entitled to compensation by the state for such services. It is further provided that the commissioner of agriculture shall proclaim rules and regulations covering the thorough destruction of all plants and for the cleaning of ground upon which infested cotton has grown, such rules and regulations shall also consist of directions for shipping cer-

tain cotton products, and rules for growing and harvesting cotton in condemned fields.

The pink bollworm law further provides that if the commissioner of agriculture deems it necessary to the protection of the cotton industry of Texas that the growing of cotton in any quarantine district or part thereof be prohibited, he shall certify such fact to the governor, who thereupon declares the growing of cotton in such area a public menace and proclaims it unlawful to grow cotton in such district for the number of years specified in the recommendation of the Pink Bollworm Commission. It makes it necessary for the commissioner to inspect such area after each crop season and have additional commission hearings for the purpose of continuing a non-cotton zone or changing the same to a regulated zone.

A section of the act provides for the proclaiming by the governor of a regulated zone in which it is permissible to grow cotton under rules and regulations by the commissioner of agriculture, embracing the planting of cotton seed from non-infested territory, beginning within the zone, marketing, and such other rules as may be deemed essential. The regulations also include the destruction of cotton fields which may be found infested in regulated zones, and provisions are made for compensation to the grower for such cotton destroyed. Compensation is not allowed, however, to any person or persons violating the proclamations, rules and regulations. Steps under this act were taken early in the spring of 1919, when it was recommended by the Pink Bollworm Commission, after holding a public hearing at Houston on April 18, 1919, that the original non-cotton zone 2 and 3 should be changed to a regulated zone. This was done by proclamation of the governor and the work of growing cotton has been supervised by state and federal officials. Pink bollworms were again found in this territory in the fall of 1919, and the cotton is now being destroyed after having been appraised by proper committees.

The act provides that the commissioner of agriculture and his authorized agents shall have the power to enter into any field or fields of cotton or upon any premises in which it may be necessary to enforce the provisions of the act. It is also provided that the commissioner of agriculture of Texas shall cooperate with the secretary of agriculture of the United States in any measures authorized and to be undertaken in preventing the introduction of the pink bollworm into the United States through the state of Texas. It has been fortunate for Texas that this clause has been inserted in the law, because of the fact that the federal government came to our rescue with men and with funds when under the circumstances the state itself could not have con-

trolled and checked the heavy infestations of pink bollworms that were found in the state in 1917 and 1918.

In the penalty clause of the act heavy fines are assessed for not reporting the presence of pink bollworms in cotton fields and for the violation of provisions of any proclamation, rules and regulations.

In the act of 1917 the placing of a certain limited quarantine or non-cotton zone was left almost entirely with the commissioner of agriculture and the governor. This created considerable dissatisfaction and the law of 1919 was so amended that it now carries a provision by which a Pink Bollworm Commission consisting of five entomologists, one designated by the governor of the state; one appointed by the State Department of Agriculture; one by the A. and M. College of the state; one by the Federal Department of Agriculture; and one appointed by the county judge in which the infestation occurs, which commission must, after having received certified reports of infestation, make investigations of such reported infestation; hold public hearings in or near the infested area and recommend to the commissioner of agriculture the nature of quarantine (non-cotton zone or regulated zone) which shall be promulgated and proclaimed by the governor. The area to be quarantined shall not exceed a distance of five miles from the outermost known infested field.

The Pink Bollworm Commission held a public hearing at Marfa, March 27, 1919, and recommended non-cotton zone No. 5 consisting of the counties of Presidio and Brewster.

A meeting was held at Pecos by the commission on March 29, 1919, and it was recommended that the infested areas at Barstow and Pecos in the counties of Ward and Reeves be placed in a regulated zone.

A hearing at Hearne, Tex., by the commission on April 17, 1919, recommended the continuing of non-cotton zone No. 1, and a final hearing at Hearne on October 15, 1919, recommended the reduction of non-cotton zone No. 1 to the city limits of Hearne, Tex.

The commission held a public hearing at Houston, Tex., on April 18, 1919, and recommended the changing of non-cotton zones 2 and 3 to a regulated zone for the season of 1919.

The commission as it now stands consists of the following members: Dr. W. D. Hunter of the federal government; Ernest E. Scholl of the State Department of Agriculture; Prof. S. W. Bilsing of the Texas A. and M. College; Mr. K. M. Trigg, planter of Bastrop, representing the governor of the state.

The county members are now being appointed for hearings at Houston, Tex., on January 6, 1920, with reference to the new infestations

in zones 2 and 3; at Eagle Pass on January 8 on zone No. 4; and at Marfa, January 10, on zone No. 5.

As further provided by law the inspection affidavits, as well as the commission reports are filed in the office of the commissioner of agriculture at Austin, Tex., where they are open to inspection by the public.

The act further provides that the commissioner of agriculture shall make adequate investigation with reference to the presence of the pink bollworm in the state and shall take prompt action to secure and maintain quarantines. For the purpose of enforcing these provisions, the commissioner may employ and prescribe such inspectors as may be necessary, and fix their compensation. An appropriation is provided for the payment of these inspectors in the services made necessary to enforce the act.

Besides the emergency clause there is a section providing that the several sections of the act shall be construed as cumulative in effect, and shall not be held to modify the provisions and restrictions or requirements of other sections. If any provisions of the act shall be declared unconstitutional, such fact shall not operate to invalidate other provisions.

In a number of test cases this act has been ruled by proper legal authority to be constitutional, and it is the opinion of the writer that under its provisions, and with the aid of the federal government, it will be possible to absolutely exterminate the pink bollworm in the state of Texas, and to prevent new infestations coming in from Mexico.

The following data will give the readers a general idea as to the location of each pink bollworm quarantine area in the state of Texas and the exact area of each of the zones:

PINK BOLLWORM QUARANTINE PROCLAMATIONS IN TEXAS

Original quarantine proclamation, zones 1 and 2	1/21/18
Quarantine proclamation, zone 4	2/19/18
Quarantine adding territory to zone 2	2/25/18
Original non-cotton proclamation, zones 1, 2, 3	2/25/18
Proclamation changing Hardin County line	3/21/18
Final quarantine proclamation	5 /7/18
Quarantine proclamation, zone 4	4 /9/19
Quarantine proclamation, zone 5	4 /9/19
Quarantine proclamation, zone 6	4 /9/19
Hearne quarantine proclamation	4/24/19
Hearne non-cotton zone No. 1	4/24/19
Regulated zone 2 and 3 proclamation	4/24/19
Regulated zones 6A and 6B	5 /1/19
Proclamation reducing zone No. 1	Oct. 19

education. He is now to begin with books and to acquire knowledge. "You are going to study, now," we say, "and to learn."

"To learn what?"

"Why, to learn many things; spelling and reading, addition and subtraction, all about the different countries and about history, and many other interesting things."

Thus is the great process started and thus it proceeds. As the years pass these matters expand and sub-divide. Arithmetic becomes algebra and geometry, geography grows into political economy. In due time these foundational studies are succeeded by the specialized subjects of college and graduate work. Presently, the round finished, the last laboratory period at an end and the thesis typed and bound, our young man enters his profession and takes up the daily life of a scientific worker. He has completed his equipment.

This accoutrement of formal knowledge is what we usually mean when we mention the training possessed by a graduate ready to undertake a position. Naturally, it is the acquisition that our young man treasures as his principal qualification for the successful pursuit of his calling. Often, in combination with our particular record of experience, it is the measure by which those of us who are no longer beginners take stock of our possibilities in speculations on professional advancement.

Now it would be idle to minimize the value and significance of fundamental and specialized knowledge in the training and equipment of the scientific worker. We all recognize its importance. Nothing else can take its place. Without it there can be no constructive planning of a life of scientific work. It is the string to the bow.

But we shall be foolish if we think of this phase of equipment as the sole or even the major factor that has to do with advancement in a scientific career. It is but one of several. It is indeed one of the hinges on which may swing wide the door to success in life's work. Perhaps it is the top-most hinge. But unless the others that rightly belong there are in place, skillfully made, well-fitted and properly oiled, the door will sag and will never open wide to the full and glorious vision that lies beyond.

The scientific worker, like any other normal person, wishes to succeed in his work. But how shall we define success?

If in our definition we propose to lay hands on concrete and specific terms, no man may define success, except as it applies to him and to him alone—and not even then unless he is more skillful in analysis of his own personality and more deeply aware of the inner meaning of his surroundings than most of us can ever hope to be. For no two men

ever seek the same combination of ultimate ends or propose to arrive at them by precisely the same means.

Yet, we may safely assert that for everyone life is a constant striving toward some goal. No one may escape this effort. It persists through every conscious hour, through every month and every year, so long as life lasts. The particular end for which the individual spends his effort may be noble or base, generous or selfish, physical or mental, fleeting or permanent. It may involve the sweet or the bitter in its attainment. But a striving for it exists always.

We may rightly say, too, that for each individual the day's work holds out some measure of attainment of the object of his effort. This measure may be little or great. Its sum at the end may be tragically small; it may sometimes be unfortunately large. Happily it may be such measure of attainment as to fulfill a well-balanced ideal of a well-rounded life.

Since we do strive, inevitably, and since we do attain, inexorably, may we not define success for the scientist, as for any other thinking being, as a reasonable attainment of worth-while objects of effort.

In reaching this attainment the course of life follows no broad highway. For each individual it is a devious path, winding its way amid constantly varying surroundings, crossing and re-crossing a thousand other paths. He who travels the path must find himself always in varying contact with the physical world about him and with the other human beings who people that world. In his course he must reckon also on the physical, mental and moral makeup that constitute his own person and personality.

It is true of all living things that daily life is a succession of contacts. Its orderly program is a series of adjustments to these contacts and to the conditions and circumstances that they carry with them. For all animals except man the nature of the adjustment is fixed. It involves a problem only in a wide and general sense, not in an individual and specific way. The reaction to a given situation must be speedy, automatic and effective. If it were not, it would not have persisted.

Some such simple arrangement must have prevailed for human beings also in the ages long ago. But with the ability to think and to plan, to alter and control our physical surroundings, and in doing so to unite with others in common effort, there has come to us, as a part of our heritage, a vast and increasing complexity of adjustment. Conditions that were simple have become many-sided problems involving infinite mental and moral checks and balances. Daily life, which was once a well-charted course, has become an intricate study.

In speaking of adjustment the word must not be misconstrued. It

implies recognition of circumstance, but it ought never mean surrender or subservience. The history of mankind is too crowded with the records of victory over difficulty to recognize any doctrine of retreat. Hueber, a scientist with sightless eyes, Beethoven, a great composer living in a soundless world—these and a multitude of others deny the existence of defeat.

In this problem the scientific worker today shares in marked degree. If, for a moment, we may place ourselves at a distance from the typical day's work of the scientist, in order that we may compare it with the round of duties of other men, we shall find that it is not set to a certain program as is that of a great number of people about us. For others the routine of the day is fixed. The procedure to follow is settled. The job is standardized. Nothing of that sort is or should be true of the scientific worker. His very freedom itself complicates his task. The manner of his work he may alter if he desires. Furthermore, his life is lived in a world within a world. He has a double adjustment to make because of contact with fellow workers in faculty or department and a quite different contact with the remaining people of his community. The very subject matter that constitutes the basis of his life's task is in a constant state of change and growth. Steel is not steel in his day's task; wood is not wood. The material he works with today has changed by tomorrow. Because he is earning his living with his brains he is apt to forget about his body. A multitude of his daily adjustments must be intangible. Their properties and bounds may not be held up before the eye but are invisible, fleeting. Yet, just for these reasons it is vital that the scientist should be making these adjustments with skill, understanding and foresight. They are worth his study.

With few exceptions scientific workers are employees of some institution or bureau whose function it is to bring together men in the same or related lines of work. Our daily associates, therefore, are for the most part men who are engaged in work similar to our own. Their aspirations are brother to ours. Their gifts and failings are our own. Whatever tendency to prejudice girdles them about pulls equally at us. The circumstance that gets on their nerves gets on ours. And so, too close contact of like substances occasionally sets up friction, in the heat of which some of our best possibilities are apt to boil away in useless vapor.

Now it is obvious that we all desire the buoyant help that comes from the well-founded admiration and respect of our associates. There is no stronger incentive to good work than that. We crave and need the well-earned approval, confidence and liking of our co-workers.

Yet it is a law of human contact, long since proved by experience and deeply rooted in the makeup of all of us, that we get from our neighbors what we give to them. Think of them as what they are—able men and women doing good work—and they will soon think of us in the same way. Realize that they are living out their lives in their own way, as is their right, and that our failure to see their good work is due to the glasses that we have placed before our eyes. It would not be well that all kinds of human excellence should be alike.

"Men," said Dr. Holmes in *The Autocrat*, "often remind me of pears in their way of coming to maturity. Some are ripe at twenty. Some come into their perfect condition late. And some, that have been hard and uninviting until all the rest have had their season, get their glow and perfume long after the frost and snow have done their worst with the orchards. Beware of rash criticisms; the rough and astringent fruit you condemn may be an autumn or a winter pear. . . ."

In the relation between ourselves as members of a staff and the officers of administration to whom we are responsible there should exist a thorough understanding, carefully and thoughtfully maintained. On our part, as employees, it will be helpful to remember that in the various problems that arise involving adjustment between ourselves and administrative needs we are quite likely not to know the whole facts of the case. If we knew them probably our views of the matter would be altered. It is a very human and very universal failing to form opinions on insufficient data. We all do it. Most of us have had the experience of discovering, at a late date in a discussion, facts that we did not suspect and that, once known, altered our judgment. We cannot see all around from a position down below. The point of view from which complete vision is available is at the top.

Turning the question the other way about, if we ourselves have administrative functions we shall strengthen the efforts of our associates and assistants if we will bear in mind the clarifying effect of complete information. Men cannot read one another's thoughts. And since they must come into intimate contact and must base their acts, in ever-increasing degree, on the plans and purposes of others, a frank discussion beforehand is a worth-while help and safeguard.

In this same direction it is to be hoped that the process of organizing going on within our various bureaus and institutions may not proceed to the point where forms and formalism displace personal contact and understanding. The thing seems to be like some plant that has escaped from cultivation: a useful species to indicate a border or a path but a nuisance and an obstruction when it gets out of bounds. One is reminded of the words of Mr. Britling, where he says, "All organization, with its implication of finality, is death. Organized morals

or organized religion or organized thought are dead morals and dead religion and dead thought. Yet some organization you must have. Organization is like killing cattle; if you don't kill some the herd is just waste. But you mustn't kill all or you kill the herd."

For most scientific workers it must appear that the ordinary day is filled with a multitude of minor duties. Routine of some sort absorbs an extraordinary proportion of our time. In the midst of this it is difficult to see how we may find opportunity for thoughtful and constructive adjustment. This round of routine is apt to grow more extensive and exacting as the scientist advances in professional rank.

In the midst of this distraction it is well to realize that any man, in any pursuit whatever, finds a multitude of details that must be done in order to carry forward his work. Even in purely creative work, in writing or painting, there is a necessary routine that will astonish one who has not observed such work in the making. Doubtless it would impress us as drudgery to spend weeks in study of a set of blank walls, yet that was a part of the process by which Michelangelo executed his great frescoes. We are charmed by the beauty and vivid detail in the novels of Scott, but we find that he spent many days in intimate study of the topography, botany and geology of a locality before he used it as the setting for one of his incomparable scenes.

All of these details were necessary means to an end. In no other way could that end be achieved. And because they were necessary they were a part of that end. They helped to bring about the consummation of an ideal. In so doing they, themselves, became a part of that ideal in just the same essential degree that the foundations of a building, deep beneath the ground, are an essential part of the final structure.

So, in the routine of our work as scientists, details have their part in building toward an ultimate ideal. Without the interest of that ideal they are so many bricks and so much mortar, heavy to handle, dreary to contemplate and devoid of any attractions. But from these materials we may, if we will, build structures whose service and beauty are limited only by our capacity and enthusiasm.

A purpose, then, is the alchemist which can transform a day's drudgery into a day's progress. If it should be that interest itself is fundamentally lacking for any of us, then there must be a misfit somewhere and if there is a misfit there must be a change. A change may be of two sorts. In rare instances the circumstances may be such that a change of occupation is really the only way out of a difficulty. But usually it is not that which is needed. It is a subjective question rather than an objective. The alteration required is in our own viewpoint rather than the thing viewed.

It is a happy truth of psychology that interest tends strongly to follow close on the heels of purposeful work. Throw your energy into a task and the task itself speedily acquires a surprising interest. Assume the attitude of enthusiasm and presently enthusiasm follows. But sit down and look askance at a duty, thinking what a dreary round it is, and interest will shy away beyond reach or ken. Contemplate the job long enough in this fashion and by and by the job itself will become impossible.

It is a further reassuring law of psychology that wherever interest exists there will be found some measure of innate ability. If we find that we can instill interest into the day's routine we may be sure, also, that there lies within us the power to build out of that routine an attainment worth while. In so doing we shall inevitably find pleasure in the work. For there is no other pleasure possible to a human being that can equal the satisfaction of carrying through a worth-while task to successful conclusion.

If, as we contemplate our ordinary daily routine, it appears that much of it fails to lead us anywhere, may we not look on that fact itself as a problem of surpassing interest. When we have given it study as such, we shall certainly find a way to improve conditions. In so far as we may exercise a choice it will be worth our while to single out for more sustained effort the parts of our day's work that are permanent and worth while. Many of us must have been surprised to discover at times that under necessity we could carry through an effective day's work in a half day's time. It would be foolish to attempt this at the expense of needed recreation, rest, and study. Nevertheless, there is something of suggestion in the experience. Success in life is not so much a matter of exceptional brains as a question of the habitual daily program.

A human being is fortunate that has the privilege of following out some line of investigation as a part of his normal duties. A scientific problem is to the mind precisely what physical exercise is to the body: both an incentive to effort and a means of increasing the power for such effort. Granted that we have opportunity for investigational study—and all of us should have it in some fashion or other—we may rightly expect from these duties the increased mental efficiency that is certain to follow their performance. A scientific worker, if his daily task is well conducted, must learn how to think.

Now thinking is not a continuous process in the human race—including ourselves. A very great part of our activities are automatic. We arise in the morning, dress, eat breakfast, look through a morning newspaper, ride to the office, open our mail. Friends or associates arrive and we converse with them on various topics. We hear classes, mark

papers, sign reports. Presently it is evening and the day is done. In the course of this we have, occasionally, done some real thinking. But it has not been so continuous or so deep as to strain our mental faculties.

The scientist, in the investigational phase of his day's work, must learn to do better than this if he is to stand in good repute. The road by which he may surely arrive at scientific truth bears little resemblance to the sketchy path ordinarily followed in reaching conclusions, even his own, outside of science. People in general do not actually think out statements of fact. Select ten newspapers. Toss a statement through them to ten hundred thousand readers. It will be gulped down promptly and completely, like so much breakfast food. We all do it. Start a rumor and you can watch it grow into fact before your astonished eyes. Not all people impose thus on themselves all of the time, but some of them do it all of the time and all of us do it some of the time. If, in addition, the supposed facts are fed on sentiment their health and strength are doubly assured. Falsehoods swallowed as facts are causing acute indigestion in the labor world today. In the words of Josh Billings, "Tain't what men don't know that makes trouble in the world; it's what they know for sartin that ain't so."

Even experience seldom furnishes complete and reliable data. It may readily afford isolated facts but the causes of those facts may remain totally obscure or completely misinterpreted. The observations that make up experience usually lack the precision that is a necessity in genuine scientific work. They are not planned to secure continuity. They are not marked by that freedom from personal bias which is essential in a clear-cut search for truth. The observer has seldom the foundation of apperceptive data in the light of which alone can findings be properly weighed and measured. On the contrary, related facts are likely to be faulty. A king of England, a good enough king, once asked the Royal Society to investigate the reason why, when you place a live fish in a bucket of water, you do not thereby increase the weight of the vessel of water. The members of the society replied by correcting the fact.

All of which serves to point out the mental stimulation that is a happy by-product of investigational studies. Real thinking may be somewhat unusual, but it is quite an available process, in the exercise of which one's mind is inevitably quickened. The methods of research are good standards to carry over into other phases of daily life.

Consciously or unconsciously we follow a rather definite procedure in every piece of genuine investigational study. It begins with the stimulus of an unsolved problem. Thence it proceeds through successive orderly steps which include the isolation of a specific question

for study, the collecting of experimental data, the formulation of hypotheses, the trial of these while withholding judgment and finally the proposal of a conclusion which we have found to stand trial and test. There is much of interest and suggestion in these steps.

The stage by which we recognize the existence of a problem is presumably automatic. It is automatic because there are so many unanswered questions to perplex daily life. Some of these are bound to press upon our consciousness, clamoring for solution. We are not aware of all of them for the reason that we have grown accustomed to accepting many things as they are.

Out of the multitude we select a specific question to which our energies will be devoted. This essential preliminary step is not always easily accomplished. Various questions are complexly inter-related. We must unravel some of these intricacies. We must pare our subject here and there, in order to reduce it to usable size.

Then begins the step of collecting data. We are now to set ourselves patiently to observe facts and to record them. But that is not all. The facts must constantly be observed in the light of their possible relationship, for the ultimate object of our inquiry is a matter of causes and, therefore, of principles and laws. Mentally, we have in this a somewhat delicate balance to maintain, for we must be painstakingly accurate yet must not become wrapped up in detail to the exclusion of wider truths, we must demand that which is concrete and specific while searching for that which is abstract and generic, we must be skeptical yet possessed of an open mind. Neucomen was searching for truth and demanding fact as he went about his study of the steam engine. But his open mind flashed to him an interpretation when his apparatus performed in unexpected manner, and the result was the principle of condensation by means of a jet.

In the light of our accumulated data we propose our tentative theories and in this we shall need all that we possess of constructive, resourceful imagination. Sometimes we speak of imagination as if it were a handicap to a scientific worker, a faculty to be sternly repressed and stifled. There could be no greater error. A well-ordered power of conjecture is a precious attribute. Observation alone is not sufficient. Facts by themselves do not disclose relationships. All of the observable facts in the world, unilluminated by imagination, would never have disclosed the causes of insect fluctuations, the laws of the procession of the planets or the possibility of liquid hydrogen. Only when winged by conjecture, can the mind cross the void from fact to relationship. "The imagination," said President Eliot, "is the greatest of human powers, no matter in what field it works—in art or literature, in mechanical invention, in science, government, commerce or religion;

and the training of the imagination is, therefore, far the most important part of education. . . . Constructive imagination is the great power of the poet, as well as of the artist, and the nineteenth century has convinced us that it is also the great power of the man of science, the investigator, and the natural philosopher."

While the process of accumulating data is proceeding it is helpful to stop sometimes with the deliberate intent of withdrawing a sufficient distance from the object of inquiry to see it in perspective and to discover if its newly-ground facets may not catch some light from its surroundings. In the laboratory notes of Faraday are these words: "Nothing is too wonderful to be true if it be consistent with the laws of nature. Let us encourage ourselves by a little more imagination prior to experiment. Let the imagination go, guarding it by judgment and principle, holding it in and directing it by experiment."

And finally, in the course of investigation, we find ourselves practicing that rarest of mental acts, suspension of judgment while our theories are standing the trial of deliberate test. It is a fine training. Men do not usually withhold their opinions in that fashion. Suspense is unpleasant to the human makeup. Continue the suspense long enough and there is relief in the drawing of a conclusion however hasty and ill-considered. Wrap the mental makeup in the mantle of likes and dislikes, prejudice, desire or habit, and deliberately suspended judgment becomes rare, indeed. To practice it is good discipline.

And so, in following out these processes in the course of his daily work, the scientist may rightly feel the satisfaction that comes from doing worth-while things in a worth-while way and may readily find for himself the interest that goes with a program of exploration and adventure. There is no visible limit to the field. For every truth that was dug out of the darkness in the course of the nineteenth century, a hundred have seen the light in the twentieth. No one has ever reached the horizon of scientific work. As new rooms are added to the great edifice of science there are new, dim corners to be explored.

Nor may we assume that all that we commonly accept now is necessarily true. Acceptance is not finality, even in the face of abundant proof. The earth was known to be the center of the universe until Gallileo and Copernicus discovered otherwise. Not many generations have elapsed since a professor in Harvard University proved that to telegraph to Europe beneath the ocean was impossible.

In the classroom duties that fall to the lot of many of us there are extremes of contrast. The work may be made a dreary routine of boredom or it may be enlivening, interesting, inspiring. You will readily find examples of each.

The teacher is a good deal like a gardener. There are plants of various characteristics filling the garden. Individually, they are what they are, so far as species is concerned. The gardener cannot change that. He cannot bring them plant food to be injected into them and thereby change their makeup. But he can shape their growth and can profoundly influence their final form and utility. In accomplishing this he must hoe and rake and lug water. If he thinks of these tasks as sheer, purposeless routine, his garden will suffer and he, himself, will lead a dreary existence. If he considers his plants as living things, whose possibilities he will deeply influence, his daily task is illumined and refreshed.

Why are students taking the courses that we offer in college? What are the purposes of college training? It may not be amiss to consider them, for they are not always clear in the dim light that sometimes pervades college classrooms.

Undenially one of the purposes of any college course is to increase the students' store of usable facts. From much of the curriculum we might infer that this is the only important purpose in going to college. It is not so. But, frankly, it is a real purpose, an honest one. It is not so much a case of storing facts that shall in after years be promptly recalled on request, like so many cartridges stored in a mental magazine, each ready to go off on demand. The wider and deeper aim is to increase the range of acquaintance of the mind, to give it a sub-conscious foundation for a purposeful structure that is to come later. Facts form a necessary apperceptive basis. They are bridges leading in many directions. They furnish for the living room of the mind a sort of indirect lighting that illuminates shadows and enables future work to go forward smoothly. So the storing up of facts is a proper purpose.

But facts are interesting in their relationships. They lead by induction to principles. Whereas facts are limited and exclusive, laws and principles are limitless and inclusive. Facts are the minute pieces of a mosaic. Principles are the pattern. A knowledge, then, of principles and laws is a further purpose of college training.

These things, facts and principles, are external. But it is the purpose of a college education to train the student to think for himself; to make his own observation of facts; to draw his own safe and sound conclusions. In the words of Coleridge, "to educate is to train to think, for by active thinking alone is knowledge attained." In the exercise of this function the student is to construct his life's program of activity. And so it is a third function of college training to help the student to realize his best possibilities in his life work.

Yet, even this is not the summit of college aims. We should be doing

our task poorly and incompletely if we thought only of facts and laws and their utilization in efficient mental process. A college has failed unless it has given to its young men and women a wider vision of life itself, has pushed back the horizon, has served to give new meaning and value to the things which make up life. "The purpose of education," said Spencer, "is to prepare for complete living."

The method, the technique, by which the instructor may best seek to further these purposes has never been well studied and defined in the realm of college teaching. There is no comprehensive fund of recorded experience on which we may draw. In meetings of college faculties our time seems rather to be occupied with discussion of proposed new courses, re-arrangement of those that exist and discourse concerning student absences, grades and petitions. There appears to be a sort of general theory that a college student is mature and fixed in his mental processes. It seems to be sufficient if the instructor enunciate a multitude of facts. And, in truth, probably the instructor is doing as he was done by.

But the psychology of learning does not cease with the grammar grades. Indeed, in the great fundamentals, there is probably little difference between the learning processes of the high school student and those of the college student. In the secondary schools the question of teaching methods has received much study. There is no reason to confine to the high school many of the principles now recognized and accepted. Read again that lucid volume by William James entitled "Talks to Teachers," and consider if the suggestions there made do not apply to all teaching.

In our college classes, as in the grades, we shall do well if we take pains to lead our students from the familiar to the unfamiliar and not plump them into the wholly new without anchor or compass. The store of experience and knowledge that a student already possesses is his only possible basis for understanding and interpreting new facts. The bridge from the unknown to the known cannot span great gulfs at a single leap, but must arch from pier to pier. The new thing that has a discernible relation to something already familiar is armed at the outset with interest.

Again it will best avail our purposes if we constantly let the simple precede the complex, the concrete precede the abstract. To proceed from principle to example, even though the principle may be expressed in few words and the example require many, is to run contrary to the normal process of the human brain. A law is simple to us as teachers because we have had experience with many illustrations of it, but to the student who lacks this apperceptive data the law is complex.

We need not be ashamed of constant and constructive effort to

arouse and maintain interest in our classes. "Interest," said Joseph Cook, "is the mother of attention, and attention the mother of memory; if you would secure memory you must first catch the mother and the grandmother." If we would be certain of intelligent interest from the beginning we must make sure that the bearing of our particular study on college training in general is understood by our students. Certainly there is a reason why we propose to ask their time and attention. If there is none we'd better do something else. But the real relation of that particular study to the student's equipment may be quite obscure and its bearing once revealed may be an agreeable surprise.

Throughout all of our contacts in teaching we shall greatly help ourselves and our work if we thoughtfully cultivate a sympathetic understanding of the student's point of view. It is not the same as ours. The scale by which he measures the importance of life's events is different from ours. In any life such a scale is constantly changing. Our own has materially altered and will keep on changing so long as we live. We are apt to forget that and thereby to misjudge a student's exuberant interest in fraternities, sports and kindred affairs. Those things are his own. They are absorbingly interesting. If we permit our classes to be dull can we wholly blame him for his choice?

In any of the contacts into which the winding path of the day's work may lead us, we, ourselves, form half of the bargain. Adjustment then must always be as much concerned with the person that travels the path as with the path itself and its other travelers.

In this purely subjective side there can be no doubt as to what factor ranks first. A good many years ago a man named Paul, in a letter to the people of Corinth, spoke reverently but sternly of the human body as a temple. For thousands of years before that and through every year since, the admonition has been constantly repeated. It must be confessed that we need it.

The fact that we as scientists are engaged in work of a mental character may make the way easy to imperfect health, but it in no wise makes that physical state allowable. On the contrary, because of its mental product, our machinery for the day's work is the more easily rendered inefficient. No mental process takes place without a corresponding physiological output. We drive our team of body and mind with a single pair of reins. As we direct the one, so goes the other.

In speaking of health we mean today more than freedom from obvious bodily impairment. There is a state of health much higher than that, a physical trim, a complete well-being in which one's poise is perfect and alert, one's energy instantly ready, one's reserve full

and complete. Such physical fitness promptly carries over into the mental world. It clarifies judgment. It eliminates boredom from routine. It establishes confidence. It carries its possessor forward to an undreamed-of realization of his own possibilities. It makes us pleasanter people to live with.

Few of us possess real physical fitness. Of the thousands of men who have been examined by the Life Extension Institute,—most of them men of exceptional intelligence and training,—an astonishing percentage are found to be physically impaired. Usually these men did not know of their impairment or that they could readily, in most cases, attain a degree of health and efficiency hitherto unguessed.

It has been easy to slip into ways that reduce physical vigor in these modern days of highly organized mental and economic life. The grandfathers of most of us had to be physically active. On the whole they probably lived a more normal physical existence than most of us enjoy. There is no essential harm in present-day strenuous living if we order it thoughtfully. But we must think about it. We can avoid subjecting ourselves to senseless hurry, to unnecessary eye strain, to ill-considered diet, to worries carried home. We can work, play and sleep in the rejuvenating oxidation of fresh air.

None of us ought to permit himself to finish the day's work with reserve energy materially depleted. Fatigue is not local. When any part of us grows tired our blood stream carries the poison to other parts of our body; we cannot overwork one part without feeling the ill effects elsewhere. It is helpful to remember this, because physiologists have come to have a new conception of the importance of brief and frequent relaxation as a means of maintaining one's store of reserve energy. We shall work better if we deliberately seek it.

We need occasional long vacations. There is no other way in which to get a renewed and freshened outlook on our work and to clarify our appreciation of life's values. Keeping one's nose to the grindstone is neither the proper place for the nose nor a suitable occupation for the grindstone. "There is nothing," said Stevenson, "so much a man's business as his amusements." If we stay close to our work long enough and steadily enough, we come to believe, after a time, that the work would collapse without our help. Eminent statesmen in our own recollection have illustrated this phenomenon. We get into a habit of daily routine which unconsciously we dislike to break. We need the change but we shy from it. There is no surer proof that a new set of surroundings and a new viewpoint will be wholesome for us.

Even without waiting for a vacation period we may find great help in restoring to our daily round something of the physical activity that

our ancestry proves that we need. Walking twice a day two or three blocks to one's office is not following a system of physical exercise. Walking five or ten miles is getting nearer to it. Whatever the form of exercise there must be interest in it. Forget the elements of your profession. Study the stars. Observe the rocks. Carry a camera with you. Train your lens on flowers, trees, birds, landscapes. Let it help your eye and mind to a new viewpoint and your body to new vigor and well-being.

If that which we choose for our diversion is well selected, if we follow it consistently, we shall be certain to find that our interest in it widens and deepens. Before long we shall have that excellent adjunct to the day's work of the scientific man—a hobby. Any man is the better for the possession of a judicious hobby. We, who are living in the circumscribed scientific world, are no exception to the rule. Through it we shall daily freshen the flavor of our routine work; we shall the better understand the bearing of our profession on the affairs of the world at large and the right relation of ourselves to the workers in the wider world.

This, like many other phases of the day's work, is a question of deliberately organized habit. We used to think of habits as largely a matter for lifted eyebrows, the facetious subject for New Year's resolutions. They may be that. But they may, also, be one of the most useful and satisfactory attributes of living. They are not necessarily dogged, senseless, fortuitous affairs. We may build them largely to suit ourselves. It is one of the pleasant things about psychology that it has taught us how to transmute our routine of physical life into a program of mental and spiritual growth. Even the posture that we school our body to assume presently finds its reflection in our mental attitude. The erectness of body, the level carriage of head, the vigor of muscular tone, the sturdiness of strength, the poise of co-ordinated muscles, all of these we may deliberately seek, and in the finding we shall renew our inmost character.

By this means we may choose what we shall be. True we shall never attain to all that we choose. It would not be well for us that we should, for life is quest as well as attainment and its fullest measure is realized in a reasonable mixture of the two ingredients. We shall not even have before us an unvarying, specific ideal, for that toward which we strive does not assume such definite form. Its outlines are always indistinct and always changing. But its substance we may picture in our mind and heart and as we contemplate that picture, so we shall grow toward it.

* Through it all there is ever this truth: that to the scientist is granted the great privilege of a life of service to his fellow men. In the con-

sciousness of this privilege, realized little by little in the course of the day's work, there can come abiding joy.

VICE-PRESIDENT RUGGLES: Is it your pleasure to discuss the address at this time?

MR. C. L. MARLATT: I have been very much pleased in listening to this discourse. I think we all have been interested in the philosophical discussion of a broad subject. I think the greatest compliment to Professor O'Kane is to accept this address as a thoughtful, well-rounded subject, of interest to all of us and helpful to all of us. In lieu of discussion, if I have sensed the situation, I should be glad to move a vote of thanks and appreciation to the President for the Address.

MR. P. J. PARROTT: I rise to second the motion. I feel like repeating what Mr. Marlatt has just said. We have listened to this address with a great deal of pleasure. It is one which I think will prove profitable because of its common sense and its idealism. It has left us little to elaborate upon.

The motion was unanimously carried.

VICE-PRESIDENT RUGGLES: The next paper on the program is "The European Corn Borer Problem," by Dr. E. P. Felt.

THE EUROPEAN CORN BORER PROBLEM

By E. P. FELT, *State Entomologist, Albany, N. Y.*

Although the moths were reared in 1916, the insect was not recognized as a pest and carefully studied until the following summer. The investigations were continued in 1918, and the results are given in detail in the Massachusetts Bulletin (1).

SPREAD

A moderate extension of the infested territory was noted in 1918 and was followed in 1919 by the discovery of two widely separated infestations in New York state and an apparently very great increase in the infested area of Massachusetts, the latter extending from Cape Cod into southeastern New Hampshire. The known spread of the insect is summarized in the following statement:

AREA INFESTED

December, 1917

Massachusetts 100 square miles

December, 1918

Massachusetts 320 square miles

December, 1919

Massachusetts	1900 square miles
New Hampshire	20 square miles
New York	
Schenectady area	500 square miles
Western area	400 square miles

Too much emphasis should not be placed upon the apparently very great extension the past season owing to the fact that the insect was certainly present in New York areas in 1918, and very probably at least a year or two earlier. There are some who believe the borer may have been in most of these areas for nine years or thereabouts. We would prefer additional data before accepting such an estimate without reservations.

It was believed at first that the European corn borer was brought into this country with hemp imported for the use of rope walks near Boston, though there is a possibility that it may have been introduced with broom corn and in this connection it is interesting to note that there is a broom factory at Everett, Mass., an extensive broom industry at Amsterdam, N. Y., and at least one small broom factory at Irving, Chautauqua County, N. Y. It should be noted that the New York infestations have excellent rail connections with the older infested territory north of Boston. Since the European corn borer may be carried in the larval stage in the stems of a considerable variety of plants, these outlying infestations and in fact the presumably original one near Boston may have originated through the shipment of any one of a number of infested plants. It has even been suggested that green house plants may have been the original carrier, though hemp and broom corn are presumably the more probable mediums of transportation. It is a little remarkable that all infested places at the somewhat distant points are directly west and none southwest of Boston. The infestations directly south of Boston were probably brought about by the shipment of green corn to summer hotels.

CONFERENCES AND HEARINGS

1918

September 6, conference at Boston, Mass., attended by a number of entomologists and agriculturists from the northeastern United States, together with representatives of the Federal Bureau of Entomology.

1919

February 7, conference at Albany, N. Y., attended by representatives of the New York state commission of agriculture, official

entomologists of New York and representatives of the Federal Bureau of Entomology.

February 12, hearing at Washington before the Senate Committee on Agriculture, attended by entomologists and agriculturists from Massachusetts and New York and representatives of the Federal Bureau of Entomology.

February 13, hearing at Ithaca, N. Y., held by the Council of the Department of Farms and Markets and attended by representative agriculturists and entomologists of New York state.

August 28, 29, conference and field survey at Albany and Boston, respectively, attended by a number of commissioners of agriculture and entomologists mostly from the middle and eastern states.

October 3, 4, field survey by representatives of the Federal Horticultural Board, agriculturists of Indiana and the state entomologist of New York at Boston and Schenectady respectively.

October 8, hearing at Washington before a subcommittee of the Senate Finance Committee, attended by commissioners of agriculture and entomologists mostly from the middle and eastern states.

In addition the Federal Horticultural Board has held three hearings, and one conference in the past two years and the problem has been discussed at various meetings, among which may be mentioned our last annual meeting at Baltimore and the recent meeting of the National Association of Commissioners and Departments of Agriculture, held at Chicago, November 12.

PUBLICITY AND IMPORTANT PUBLICATIONS, 1919

1. CAFFEY, D. J., The European Corn Borer Problem. *Econ. Ent. Journ.* 12: 92-98.
2. The European Corn Borer, U. S. Dept. Ag., Bu. of Ent., in Coöp. with Ext. Serv. St. Agr. Coll. (poster).
3. FELT, E. P. Cornell Extension Bul. 31, pp. 35-42.
4. The European Corn Borer. Dept. Farms and Markets, Div. Agr. Circ. 182.
5. VINAL, S. C., and CAFFEY, D. J., The European Corn Borer and Its Control. Mass. Agr. Expt. Sta. Bul. 189, pp. 1-71.
6. CAFFEY, D. J., The European Corn Borer, A Menace to the Country's Corn Crop. U. S. Dept. Agr. Farmers Bul. 1046, pp. 1-28.
7. FELT, E. P., European Corn Borer. Univ. St. of N. Y., School Bul. Je. 1 (poster).
8. Proceedings of the Conference on the European Corn Borer held by the National Association of Commissioners of Agriculture, with state entomologists and representatives of the United States Department of Agriculture. Dept. Farms and Markets (N. Y.), Div. Ag. Bul. 123, pp. 1-74.
9. WOODBURY, C. G., European Corn Borer Investigations. Congress. Record, Nov. 4, pp. 8409-8411.
10. MARLATT, C. L., European Corn Borer. Rept. Fed. Hort. Bd., Oct. 1, 1919, pp. 8-13.

The federal poster (2) was widely and generally distributed in areas where there appeared to be a reasonable possibility of the borer being present. This was particularly true of New York state after the discovery of the Scotia infestation. The New York poster (7) was generally distributed to the schools of the state and in addition, popular articles were prepared, sent to practically every local newspaper and published by a very considerable proportion of them. Cornell Extension Bulletin 31 (3) was generally distributed throughout the state of New York, an edition of 40,000 being printed. The United States Farmers' Bulletin (6) was generally distributed throughout the country, specially in the northeastern United States. It is worthy of note in this connection that while the initial discovery of the two infestations in New York state were brought to light through publicity, the extension and subsequent delimitation of these areas was due in considerable measure to systematic scouting.

There are serious limitations upon publicity so far as such an insect as the European corn borer is concerned and yet it is believed efforts along this line have amply justified themselves. The experience of the past year is a very strong argument in favor of systematic, well directed scouting as an adjunct to publicity. Neither should be used to the exclusion of the other.

In addition to the official publications listed above, a few specially interested states and Canada have published short bulletins or leaflets on this pest and there have been numerous popular accounts appearing in the agricultural press in particular. It is noteworthy in this connection that Mr. Allen's article in the *Country Gentleman* of January, 1919, was responsible for bringing the Scotia, N. Y., infestation to the attention of the Cornell entomologists.

SCOUTING

The scouting of the last few months has been done mostly by agents of the federal government and the limitations in connection with the work emphasize the difficulty (10, p. 9) of quickly ascertaining the precise extent of the infested area. The approximate size of the New York areas appears to have been determined and it would seem that if the insect had become established in any numbers in other sections of the country it would have been brought to notice before this.

QUARANTINE

The Federal Horticultural Board promulgated Quarantine No. 36, effective October 1, 1918, and the states of Massachusetts and New York have also laid quarantines, modifying them as developments warranted. These quarantines were all limited to corn on the ear and

cornstalks. The state of Florida has laid a most sweeping embargo upon the shipment of plants or parts of plants from the infested area, while the Canadian government, by order of council, has prohibited the shipment into the Dominion of corn fodder or cornstalks from the infested area.

The extension of Quarantine 36 to include the entire infested area has been seriously considered by the Federal Horticultural Board and owing to the uncertainties of the situation it has not, due in part at least to the difficulties in ascertaining the limits of the infested areas, been put in force.

ECONOMIC STATUS

There have been, during the last few months some statements voiced (9, 10) tending to indicate that the European corn borer may not prove to be an insect of much economic importance. These opinions appear to be based upon the fact that there was considerably less injury in the infested area in Massachusetts in 1919 than was true of some of the badly infested fields in 1918. Apparently little allowance has been made for the possible beneficial results following a general, though perhaps not entirely effective clean-up, for the activity of ephemeral and unreliable parasites, for the fact that seasonal differences may have been very unfavorable to the borer, and the obvious variations in the infested area.

A general clean-up, even if a somewhat indifferent one, would result in the destruction of millions of borers and of itself should considerably lessen injury from the second brood. A well known, minute egg parasite, notably extremely variable in abundance from season to season, severely checked the borer. The development of the second brood injury in eastern Massachusetts was nearly a month later¹ in 1919.

¹It may be significant that both the Blue Hill (mean 68.4°, departure from normal +1°) and the Concord (mean 68.3°, departure from normal 0°) Massachusetts records show a normal or a little higher than normal monthly mean temperatures for these stations in August, 1918, and decidedly subnormal records (mean 64.5°, departure from normal -2.9° and mean 65°, departure from normal -3.3° respectively) for the same month in 1919, a period of practically continuous development and growth or the second brood. Taking 43° F. as the critical temperature (it is probably higher for this season of the year) Blue Hills would have effective temperatures for August, 1918, amounting to 787.4, an increase of approximately 4 per cent above the normal and for August, 1919, effective temperatures of 665.5, a decrease below the normal of nearly 12 per cent, the total range between the two seasons for that month amounting to nearly 16 per cent of the normal effective temperatures. The Concord records show a normal (mean 68.3°, effective temperatures 784.3) for August, 1918, and a marked decrease (mean 65°, departure from normal -3.3°, effective temperatures 682) in 1919, amounting to more than 13 per cent of the effective temperatures. These figures justify expecting a retarded development, which latter was substantiated by field observations.

Thus, a combination, rarely to be expected, greatly mitigated the damage of 1919. It is hoped that such conditions will prove more frequent in the future. It is one thing to note a deficiency of this character and quite a different matter to allow such variations to materially influence a policy which may have far-reaching effects. It is impractical to apply the general code of the criminal law and hold an insect incapable of harm until it has proved its ability to cause serious damage over wide areas year after year, because such demonstration would very probably make it impossible to economically check or control the pest.

Considerable stress (8 p. 66, 9 p. 8410) has been laid upon the practical immunity in certain small plots at Medford, Mass., of a rank growing southern corn and this has been used to support the hope that dent corns of the south would escape serious injury. The damage in none of these plots was serious and in view of the decided tendency of the moths to select early varieties for the deposition of eggs, a habit most evident in New York state, we hold it to be unsafe to rely to any material extent upon such a slight and comparatively unreliable indication.

The occurrence of but one brood with consequent limitation of injury in the infested areas in New York state is conclusive evidence of the effect a relatively slight change in climate may have upon this insect. Of itself, it justifies a pessimistic attitude toward the reduction in injury in eastern Massachusetts in 1919, and at the same time affords no substantial basis for any such relative immunity for the larger portion of the corn belt. There is every reason for expecting two and in the more southern portion of the country three broods or generations each season. The prolonged period of activity might be expected to offset in large measure, at least, any advantage accruing to a rank, rapid growing variety of corn.

The possibilities of clean culture or modifications in agricultural methods, likewise appear to be overstressed (9 p. 8410) when it is remembered that these conclusions are based upon examinations of comparatively few fields and that even in the older infested areas in Massachusetts there is considerable local variation in the degree of infestation, a condition much more marked in New York state. This is no argument against the utilization of such methods to the utmost. It is simply a warning against depending upon them to any great extent until their utility has been demonstrated.

There should be due conservatism in the estimation of probable injury and the same is equally true, if not more important in regard to approximating probable immunity.

Whether we wish to do so or not, we must shortly make a decision as to the economic status of the European corn borer. If we admit that it has serious potentialities and is capable of causing even a 10 per cent loss to the crop, we still have an insect of the first magnitude, worthy of most careful investigation and justifying the utilization of every reasonable measure to prevent spread and promote the control of the pest. Should it be decided, however, that this insect is of slight importance and is destined to have little effect upon the corn crop of the country, then we are compelled to hold that a moderate amount of knowledge concerning the insect is all that is necessary, that there is little justification for exhaustive investigations and that large scale control operations are indefensible.

If the first be true, states vitally concerned and the federal government should make liberal appropriations for the further investigation and control of this insect. Otherwise, as professional entomologists, guardians of the public welfare, we should oppose all efforts to secure money for any such purpose.

PROBLEMS AFFECTING CONTROL WORK

The Bureau of Entomology last August proposed first of all to determine the present distribution of the insect as a basis for a quarantine and other control measures. There are practical difficulties (10, p. 9) in following this plan and if there is to be effective control it will be necessary, in our opinion, to push more than one line of activity or else serious efforts to control the pest should be abandoned. The experience of the past season discloses some habits which emphasize the difficulties of handling the situation. The insect breeds in a considerable number of plants, over fifty, and has been found in the stems of quite a number of others. It is very probable that the borer multiplies freely upon relatively few plants and that practically speaking we can ignore its presence in many. We may have with this pest a duplication in some respects of our experience with gypsy moth food plants. There is need of more information concerning methods of spread, though work in Massachusetts the past season shows that individual females may make a single flight of as much as 287 yards and that marked individuals were recovered at a distance of 600 yards. Females may live 33 days, the eggs being deposited in small masses during a considerable portion of this period. The maximum egg production from one individual was 1,192. The occurrence of the borers in underground stems and their occasional presence in farm crops such as oats, greatly complicates the problem of control.

The apparent possibilities justify serious questions as to the feasibility of control. This latter can be determined only by field

operations on a comprehensive scale and in view of the destructive potentialities of the borer such an undertaking is favored.

SECONDARY CONDITIONS AFFECTING THE PROBLEM

The control of the European corn borer is by no means a simple problem in entomology or a question of organization. The infestation of three and possibly four states vitally concerns as many different sets of officials as well as representatives of the federal government and all in turn are dependent upon law making bodies for the necessary appropriations. It is entirely possible for one group or even a portion of a group to largely prevent effective work and by the very nature of the case there is such an excellent opportunity to evade responsibility, that at times it is almost impossible to ascertain the real cause of unsuccessful coöperation or activity.

These statements simply describe the situation as it exists and justify a question as to the desirability and possibility of evolving more effective ways of handling limited infestations of destructive insects. It is a condition not peculiar to entomology or even to science. It is something found in many lines of governmental activity.

Destructive insects have been introduced into this country in earlier years and similar developments may be expected in the future. It is only necessary to refer to the gypsy moth, the San José scale and the cotton boll weevil, to bring to mind three exceedingly destructive pests which were detected shortly after they obtained a foothold in the country and were allowed for one reason or another to extend their range over considerable areas. All three have been exhaustively studied and many printed pages have been devoted to discussing their habits and the most effective methods of control. With these three in mind, one might conclude that American economic entomologists have been more efficient as investigators than executives. Very nearly the same conditions obtain in relation to chestnut blight and the white pine blister rust.

A survey of the situation in the light of our present knowledge justifies the belief that it would have been comparatively inexpensive and certainly highly profitable to have attempted the extermination of these three pests as soon as they were found, even though it involved considerably larger expenditures than would be necessary after more information was available. It may be argued that eradication was impossible in the earlier days because of the lack of information. This is most easily answered by the statement that much of the most valuable data in regard to such problems come from field experience. We would not underrate in the slightest the desirability of exact informa-

tion but if we wait until everything is known very little or nothing will be accomplished.

QUARANTINE AND EXTERMINATION

The introduction of the San José scale in the east was a prime factor in bringing about the establishment first of state and later of federal quarantines, both designed to limit and prevent the distribution of injurious insects and plant diseases. Quarantines, like other human agencies, have their limitations and if they are to attain the fullest measure of usefulness, should be supplemented by exterminative measures.

There are several fundamental weaknesses in our efforts to exterminate insects. In the first place, it appears very difficult to secure a general unanimity of opinion as to the economic status of a pest before it has spread to a material extent and caused serious losses. Such delays give the insect an opportunity to multiply and if it be reasonably active and prolific, it may within a season or two escape beyond all reasonable possibilities of control. Then there is the necessity of securing funds from the state or national government and in the case of Congress at least it is very difficult to secure special appropriations with a reasonable degree of promptitude.

These conditions are evident to all. Should we not, therefore, seek to provide in some manner or other for a reserve fund which could be utilized for just such emergencies? It would make possible the beginning of operations at the outset and at the very time work could be prosecuted to the best advantage. It of course follows that investigation and scouting should also be pushed so far as necessitated by conditions but, if we are correct in our judgment, these three activities should be in a measure coördinate and interrelated rather than one being dependent upon the others. Our present quarantine laws are the outcome of years of work and desirable modifications along the lines outlined above can hardly be expected without systematic effort for presumably several years.

CONTROL WORK AND APPROPRIATIONS

Practically speaking there has been no general control work in the field aside from that done by the states of Massachusetts and New York. The state of Massachusetts attempted to compel property owners to clean up infested land at their own expense, the state even doing the work and assessing the costs against the property. Subsequently the Federal Bureau of Entomology undertook a limited amount of this work in Massachusetts on a coöperative basis and late in the spring of 1918, nearly \$100,000 was expended by the state of Massa-